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THE INTERNATIONAL INSTITUTE OF AGRICULTURE

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The Institute, confining its operations within an international sphere, shall:

a) Collect, study, and publish as promptly as possible statistical, technical, or economic information concerning farming, vegetable and animal products, the commerce in agricultural products, and the prices prevailing in the various markets;

b) Communicate to parties interested, also as promptly as possible, the above information;

c) Indicate the wages paid for farm work;

d) Make known the new diseases of plants which may appear in any part of the world, showing the territories infected, the progress of the diseases, and, if possible, the remedies which are effective;

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It has also published a volume on "The Organization of Agricultural Statistical Services in the Several Countries", and a volume on "Statistics of Cultivated Areas and of Vegetable and Animal Production in the Adhering Countries" (an Inventory drawn up from documents published by Governments), and "Monographs on Agricultural Association in Various Countries (2. Vol)".

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50	**Uruguay**	V	REQUEÑA BERMUDEZ, Chargé d'affaires of Uruguay to the Italian Government.

The information contained in some of the abstracts dealing with Canada has been most kindly placed at the disposal of the Institute by the Government of the Dominion.

The Canadian abstracting is by Mr. J. K. Doherty, the able chief of the Canadian Bureau of Correspondence with the International Institute of Agriculture.

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AGRICULTURAL INTELLIGENCE

NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of January-February 1912.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES DEALING WITH AGRICULTURE AND INDUSTRIES DEPENDENT ON IT.

Budget of the Department of Agriculture of Hungary for 1912. — Allami költségvetés az 1912 évre, Részletezés V füzet. 461

The budget of the Department of Agriculture of Hungary for the year 1912 anticipates the following expenditure arranged under the heads of the principal branches of the administration (1): Hungary

Chapter and Title		Name of Branch	Budget 1912	Budget 1911
		I. *Ordinary Expenses.*	£ s. d.	£ s. d.
XX.	I.	Central Administration .	63 080.13. 4.	57 742. 2.6.
»	2-7.	Forestry	903 872. 1. 8.	818 991. 9.2.
»	8, 9.	Horse-breeding, management of the stud-farms and of the Gödôllö estate	659 412.19. 2.	635 084. 5.0.
»	10, 11.	Veterinaries, Veterinary College	150 487.10. 0.	146 115. 6.8.
»	12, 13, 27, 29, 31.	Agric. instruction, Experimental Stations and Institutes, Institutes of meteorology, geomagnetism, and geology	182 158. 5. 0.	175 146. 5.0.
		Carried forward . . .	1 959 011. 9. 2.	1 833 079. 8.4.

(1) In this table, and throughout the article, the crown is reckoned at exactly 10*d*. (*Ed.*).

		Brougt forward . . .	1 959 011. 9. 2.	1 833 079. 8.4.
XX	14.	Cattle-breeding, Dairy. .	160 405. 8. 4.	251 205.17.6.
»	15, 16.	Administration of hydrotechnic service	122 573. 2. 6.	126 947. 9.2.
»	17-26, 30.	Fisheries, Viticulture, Apiculture, Estates of the State, Sericulture . . .	541 600.10. 0.	509 004.15.0.
»	28, 32.	Assistance of agric. labourers and of the mountain population .	138 931. 8. 4.	119 772.11.8.
IV, IX.	10, 4.	Pensions and debts chargeable to the ministry .	185 280.12. 6.	180 084. 2.6.
		Total of ordinary expenses . . .	3 107 802.10.10.	3 020 094. 4.2.

II. *Extraordinary expenses.*

VIII, II.	1-27, 2.	Temporary expenses and pensions	330 713.19. 2.	278 022.11.8.
V, IX.	1-17.	Capital employed	634 403.15. 0.	471 616. 2.6.
	Total of extraordinary expenses . .		965 117.14. 2.	749 638.14.2.
		General Total . . .	4 072 920. 5. 0.	3 769 732.18.4.

The necessary credit for 1912 exceeds therefore that of 1911 by more than £ 300 000.

The increase is divided among all the different branches of the administration, except those of cattle-breeding and of the administration of the hydrotechnic service, of which the credits for 1912 were lower than those for 1911 by the amounts of £ 90 800.9*s*. 2*d*. and £ 4 372.6*s*. 8*d* respectively. The decrease in expenditure in 1911 is however only apparent, because under the heading " Cattle-Breeding " for 1911 there is included an outlay of £ 187 500 and also receipts consisting of annuities (paid in often very late) for bulls for breeding sold to the breeders at special prices. The amount actually used under this head was therefore only the difference between the two sums mentioned, *viz.* £ 375 000. However, the budget of 1912 has not reckoned on any receipts in fixing the sum allocated, so that the whole of the credit, amounting to £ 83 333.6*s*. 8*d*. will be available for cattle-breeding and exceed by more than £ 40 000 the amount actually used in 1911.

The difference observed in the heading " Hydrotechnic Service " must be attributed to the fact that an entire branch of this service, that of the Section of Hygienic Engineers, has been transfered to the Department of the Interior; the decrease is thus only apparent.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

Exportation of Agricultural Produce from Morocco. (Les exportations de produits agricoles du Maroc). — *Questions Diplomatiques et Coloniales*, No. 38, pp. 122–123. Paris, 12 Janvier 1912. **462**

Morocco

Moroccan agricultural produce comprises:

1. Food products of animal and vegetable origin: oxen, poultry, eggs, etc., the consignments of which in 1909 attained a value of 8 285 200 francs (1), or nearly one-fifth of the total exports.

2. Raw materials for industrial purposes, *viz.* beeswax, the shipments of which in 1909 reached a value of 606 257 francs, chiefly destined for Hamburg; wool (2 693 310 francs) and cow-hides, sheep and goat skins, exported to the values of 722 350 francs, 4 684 268 francs, and 1 000 000 francs respectively in 1909.

The best customers for skins are France, Germany, Spain and the United States.

The exports of agricultural produce proper in 1909 were of a value of 20 307 143 francs.

The following table indicates the most important of them:

	Fr.
Barley	12 231 514
Beans	2 135 963
Wheat	2 011 264
Fenugreek	1 033 861
Linseed	976 703
Canary seed, millet and sorghum	644 567
Maize	492 299
Cumin seed	295 897
Coriander	236 522

Among the other products of the soil exported, mention should further be made of: olive oil, 402 000 francs in 1909; and gum Arabic and sandarac, the total exports of which amounted to 823 328 francs in 1909.

(1) 25.225 fr. = £1.

468 JUMELLE. **Notes on Agriculture and Forestry in Madagascar.** (Rapports sur l'Agriculture et les Forêts). — *Revue de Madagascar* Nos. 9-12 pp. 979-987 and 1026-1027. Paris, Décembre 1911.

There is no doubt a great future in store for agriculture in Madagascar, in spite of its having hitherto made little headway there, owing, chiefly, to the difficulty of making uniform experiments in a region of such vast extent and such varied climate.

Madagascar

Whilst in 1901 the Colony imported 26 000 tons of rice, the present local production exceeds the demand for home consumption, and opens up the way for exportation, which in 1909 amounted to 4000 tons. Silk-growing is progressing rapidly, mainly owing to the activity of the Nanisana Station. In 1904 only 9 tons of vanilla were exported, while this amount increased to 44 tons in 1909. The culture of both coffee and cocoa started on the East coast is highly promising. Excellent results in ostrich-rearing have also been obtained in the South-West of the island.

On the other hand, crop experiments made in the North and North-West, have not been crowned with success, except in the case of the cocoanut palm. The small settlements of the Centre of the Island have not generally been a success; the larger ones more so from the point of view of utilising the natural products of the soil than from the fact of having started any real agricultural enterprise.

Different kinds of crops must be developed in different regions, *e. g.* cotton in the North and North-East ; rubber in Baina, in Sambirano and on the East coast ; rice in the Centre ; and manioc, vanilla, coffee and sugar-cane in other parts. Cattle must be better fed for exporting to France, either as live animals or in the form of frozen meat.

It is of the utmost importance for the future development of agriculture in Madagascar, especially in the case of rice fields, that the country should be thoroughly irrigated. Some steps in that direction have been already taken in the plains of Betsimitatatra, Marovoay and Vakinankaratra.

In order to promote success in rice-growing, it would be advisable to form a special committee to find out the most urgent improvements to be undertaken in harvesting and storing the rice. Besides this, efforts should be made to spread the culture of cotton over the small native estates in the North and North-West. Experiments should also be continued in acclimatising foreign rubbers in the East and in Lambirano ; while it would be well to have plantations of young native rubber in the North-West. Having once for all

made sure of an outlet for the exportation of cattle, encouragement should be given to rearing them on the extensive pasture-lands in the interior of the western mountain-chain.

The colonisation committee must study the question of making sure of a means of feeding cattle during the dry season, by introducing either tuberous forage-plants or hay.

The forests of Madagascar cover an area of about 9 millions of ha. (over 22 million acres), *i.e.* about a sixth of the area of the whole island. They constitute a very considerable source of wealth, which is hardly turned to any account owing to the unfavourable condition of the surrounding country.

At the same time there is a growing impulse in favour of the export of timber etc. In 1896 only 1 401 188 francs (1) worth of timber and other forest produce was exported. In 1909 this sum was increased to 12 422 900 francs, *i.e.* 55 % of the total export trade of the colony, gold not included.

Between 1909 and 1910 the value of the export trade of Madagascar rose from 33 378 179 to 45 438 280 francs. The chief exports in 1910 were:

Rubber	frs.	9 366 922
Skins	»	9 506 530
Rafià	»	2 859 000
Tan-bark	»	2 734 000
Lard	»	1 161 000
Dried Vegetables .	»	1 160 000
Rice . . .	Tons (English)	8 120
Salt Meat	frs.	895 000
Oxen	Head of	12 648
Manioc . .	Tons (English)	4 580

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY.

Occupations of Agricultural Students after leaving College. — *The Journal of the Board of Agriculture*, No. 10, pp. 848-850. London, January 1912. 464

Questions are sometimes asked as to the parentage of the agricultural student, and as to what becomes of the student himself. **United Kingdom**

(1) 25.225 francs = £1 at par.

The Institutions were asked to supply information showing the occupation of the parents of those pupils who left during the past three years, and the occupation which the pupils themselves now follow.

The institutions have been arranged in three groups. A summary of the returns is given below:

Institutions	Total number of students leaving	Occupation of Parents			Occupation of Students		
		Farmers	Land Owners	Others	Farmers	Land Owners	Others
Agricultural Colleges.	1 064	469	160	435	843	161	60
University Colleges and other Institutions......	384	279	7	98	310	21	53
Farm Schools...........	321	221	6	94	294	2	25
Total......	1 769	969	173	627	1 447	184	138

Of 1769 pupils for whom full particulars are available, it will be seen that 1631 are known to have returned to occupations connected with the land, and the great majority are engaged in farming. The « others » number 138, and include a good many who have been lost sight of and may have taken to agriculture. As regards parentage, it will be observed that 969 were the sons or daughters of farmers, and a further 173 were connected with the land. It will be remarked that the largest proportion of pupils of non-agricultural origin is to be found in the first group of agricultural colleges shown above, the reason being that residential colleges in the country, with farms attached, are always preferred by non-agriculturists who wish to secure an agricultural training for their children.

In the past three years 231 students have attended the classes provided by the Agricultural Department of the University of Cambridge:

Of these 59 are engaged in teaching or research, or are employed in supervising agricultural work in other countries, 29 are landowners or expect to inherit land, 17 are engaged in, or are preparing for, land agency work, 13 are farming. The occupations of the remainder are unknown, but it is probable that many of them expect to inherit land or to become associated with land management.

The John Innes Horticultural Institute. — *Morning Post.* London, Dec. 29, 1911. 465

England

The work of the John Innes Horticultural Institute (at Merton, Surrey) includes the provision of investigations and researches of a practical and scientific nature, in connection with the problems of horticulture, the imparting of practical and scientific knowledge, the practice of scientific planting, and breeding, and the creation and introduction of new varieties.

An accurate knowledge of heredity must form the basis of the bulk of new work in horticultural breeding, therefore the main line of research that is being pursued is of fundamental importance to farmers.

Accepting the principles laid down by Mendel as underlying the most complex problems of heredity, the Director of the John Innes Institute and his staff are attempting an analysis of the germ cell and are striving to find the laws which govern the behaviour of the various factors by which the germ cell is influenced.

The Institute has at its disposal eight acres of land, to which two others are shortly to be added.

There are three green-houses available for the work of the Institute in the Directors' garden, and three span-roof glass-houses with a corridor in the grounds.

One of these houses is fitted with special insect-proof cages. A fourth is being equipped with a special system of ventilation, in order to make the house insect-proof.

This house is designed for work with fruit trees.

An ingenious arrangement has been devised for safe-guarding experimental crops from the attacks of birds. It consists of independent wire screens attached to a frame-work of iron, and is so contrived that its constituent parts can be combined to protect plots of various sizes.

Attached to the Institute are two small laboratories, one for chemical and the other for biological work, a photographic room being also included.

There is a small enclosure divided into pens for the experimental breeding of fowls, in which the same class of experimental work that is being conducted at Cambridge is being carried on, and there is a special room devoted to the breeding of canaries.

Important work is being done on such immediately important questions as fumigation, and on a problem of vital interest to the fruit-grower—self-sterility in plums. Interesting points in connection

with this phenomenon have already been determined by Mr. W. O. Backhouse, and the subjeet is still under investigation.

Experiments are also in progess dealing with the crossing o different varieties of plants and shrubs and with the causes of bolting or running to seed in root and other crops, as well as with the question of sex-inheritance in fowls.

466 ZANDER, Prof. Dr. ENOCH. **The Royal Bavarian Bee-keeping Institute at Erlangen.** (Die Königlich Bayerische Anstalt für Bienenzucht in Erlangen). — *Die Bienenpflege*, 34. Jahrgang, Heft 1, pp. 14-19. Weinsberg, Januar 1912.

ermany

In 1907 an Institute for Bee-keeping was annexed to the Zoological Institute of the University of Erlangen. The Institute possesses a spacious Laboratory with excellent apparatus for zoological and bacteriological studies and a heated glass house 9 metres (30 ft.) in length, 4 in width and 5 in height, covered with dull glass; in this house studies in bee colonies are carried out during winter. In the garden of the Institute the most important bee-feeding plants and a number of bee colonies in hives of every known system are to be seen.

A Museum of bee-keeping economy, a workshop, and hives that are moved from place to place outside Erlangen, complete the institution.

The principal, Professor Dr. Zander, gives courses of lectures of varying lengths on bee-keeping every year; resident pupils are also admitted for a length of time. The scientific work of the institution has hitherto been concerned with enquiries into bee diseases, honey formation, and the building work and life of the bee.

467 **The Norwegian Ministry of Agriculture and Agricultural Schools and Institutes** (1).

Norway

The Norwegian Ministry of Agriculture was founded in 1899 and commenced its activities in 1900. It is composed of three divisions: agriculture, forestry and veterinary. The administration is in the hands of the Minister and his cabinet.

The division of agriculture has the following staff: director general, agricultural adviser, secretaries and clerks, agricultural adviser

(1) From a communication submitted by the Special Correspondent at Christiania of the International Institute of Agriculture.

in England, chemists, official entomologist, agricultural engineers and their assistants, official advisers for live-stock improvement, inspector and advisers for dairying, directors of sheep-breeding stations, directors of land-registry, inspector of fisheries.

The agricultural chemists have charge of the government Stations for Agricultural Chemistry, and undertake all investigations dealing with agriculture. Farmers may have analyses of waters, soils and substances for improving the soil made free; analyses of chemical manures and feeding-stuffs are also made free for purchasers of certain quantities.

The official entomologist supplies free to farmers information on insect pests and diseases of plants and on means for their control.

The agricultural engineers and their assistants give advice as to construction of buildings, with plans and estimates if required, and information on water-power and drainage.

The advisers for live-stock improvement direct all the State Institutions for this purpose, arrange official shows, control the service stations for horses and cattle, and undertake the purchase of breeding-stock when the State makes grants for the purpose.

The dairy advisers, besides supervising the State dairies, look after the setting-up of new co-operative dairies and their rules.

The inspector of fresh-water fisheries supervises salmon and other fishing and the application of laws on the subject.

The central forestry administration includes management of all the State forests, of the public Schools of Forestry, and of nurseries for forest trees, including those receiving State subsidies. The staff includes: an expert and assistants for estimating timber, an inspector, regional forest officers, regional assistants, and planting specialists. Further, two regional officers have charge of the State moors in Finmark.

At the head of the civil veterinary service is the director of veterinary medicine, with charge of all the civil veterinary services and meat-inspection services; these are: licensing, adoption of public measures for checking the spread of contagious diseases of stock, preparation of regulations and plans for veterinary administration, importation and exportation of animals and their control, preparation of veterinary statistics, control of public slaughter-houses and cattle-markets and of communal institutions dealing with the veterinary service. To the above veterinary service is annexed one of veterinary pathology.

There are further a certain number of regional officials more or less directly attached to the agricultural department (at present 35

departmental agriculturists, 6 cantonal agriculturists, and 18 departmental horticulturists), one departmental dairy, and 14 departmental forest advisers; each commune has also two or three veterinary officials.

Agricultural Instruction.

The secondary agricultural schools, which now exist in nearly all the prefectures, are intended to give chiefly a practical training for farmers. Theoretical instruction consists of about 1000 lectures, and deals with general agricultural matters. Practical instruction is given on the model farm of the school and on the best farms of the neighbourhood, where also the students go through their practical training.

These regional schools are almost all in conjunction with large farms. The director is nominated by the Minister and is president of the administrative board. The funds are supplied by grants from the State (three-quarters) and the district (one quarter).

Students cannot enter till they are turned 18. Tuition is free, but there is a small fee for board and lodging. For each course there are a certain number of scholarships.

Among private schools is the Winter School of Agriculture at Christiania, founded in 1886, for young men who get practical instruction from the farmers of the district. The theoretical course lasts two winters and costs 9 guineas. There are 30 free places and a sum of 100 guineas for scholarships. The School receives a State grant of about £730.

Further, mention may be made of the School of Agriculture of Sein, prefecture of Asker, founded in 1887, and having winter courses of two years; the School of Agriculture of Nordmör, at Brennes, founded in 1900, with a one year's theoretical course and a winter six-months' course including practical work on the farm.

These public and private schools also serve as a preparation for the Higher School of Agriculture. There are also other schools in rural and mountain cantons which give short courses on general agriculture.

The Royal Society for the Prosperity of Norway (Det Kgl. Selskab för Norges Vel) has organized farms in several regions where practical courses on live-stock are given. Such courses have also been started by some departments.

Besides the course on horticulture in the Higher School of Agriculture, there are a good many horticultural schools in various districts. Among these may be mentioned that of Sandved at Sandnoes, that of Hylla at Inderöen, that of Aamot at Valler near Porsgrund,

the horticultural section of the agricultural school at Sein, that of Hjeltens, that of Haslum at Nesodden, the one belonging to the house-keeping school of Vaartun near Stenkjoer, and that of Revö near Sande.

Among forest schools may be mentioned those of Kongsberg and Stenkjoer, the forestry section of the schools of agriculture of Hedemarken and Christiania, and that of Smaalenene at Fredrikshald founded in 1910.

There are also the school of cheese-making at Aas, and the National School of Domestic Economy.

The Higher School of Agriculture, founded in 1854, was completely reorganized in 1897 by law. It gives two courses:

a) a general one-year course;

b) professional courses as follows:

1. Agriculture, one year.
2. Division of property.
3. Horticulture, one year.
4. Cheese-making, one year.
5. Forestry, one year.

The teaching staff consists of 11 lecturers with their assistants, and 4 tutors. The tuition is free, and there are frequent courses. The students live in.

Besides the experimental station attached to this school, there are those belonging to Hedemark, to the Society of Rural Economy of that prefecture, and to the school at Christiania. There are also seed-trial stations attached to the above.

DRIEBERG, C. **School Gardens in Ceylon.** — *Circulars and Agricultural Journal of the Royal Botanic Gardens, Ceylon*, Vol. V, No. 21, pp. 1-18. Peradeniya, 1911. **468**

The School Garden Scheme came into operation in Ceylon in May 1901.

It was introduced as an alternative to the scheme for providing agricultural instruction by means of a central school, which had existed for some years previously, but was ultimately found not to attract the right class of students. **Ceylon**

It was therefore decided to close the school and to go into the villages and take up the education of children of the cultivator through the vernacular schools of the Island. At its inception the scheme had many prejudices and obstacles to contend with, the chief of which were the objection raised by parents to their chilrden performing manual labour.

In most instances these prejudcies and obstacles have been surmounted and while there were but five school gardens at the end of 1901, to-day there are 240.

Numerically, therefore, the scheme may be said to have made satisfactory progress, but it would be more to the point to inquire if the school gardens are serving their purpose.

Their aims, as set forth in a Circular, are indicated below, and under each is appended a note to indicate the progress made:

1. To brighten the surroundings of the school and make it a pleasant resort for the boys and not a bare and unattractive building.

The changes that have taken place in the surroundings of the chosen schools have been very striking and the grounds attached to schools serve to make them very much more attractive than they have hitherto been.

2. To lighten the routine of class work by varying it with outdoor work of a recreative nature.

Where the initial prejudice against manual labour has once been overcome, the value of school gardens, in providing recreative work for the boys, will be readily admitted by any one who visits a school during gardening hours and sees the heartiness with which the children set out their work.

3. To exemplify order, form, method, and good taste in the laying out of the premises. These qualities are well illustrated at a large number of gardens.

4. To furnish a field for nature study.

In a few schools the teachers have established miniature museums, containing interesting specimens of natural objects, vegetable, mineral and animal, gathered by the children themselves.

5. To serve as an object lesson in horticulture. The gardens answer this purpose admirably. The systematic cultivation of both ornamental and economic plants, supplied by the Stock Garden, is supervised by travelling assistants who are trained horticulturists.

6. To supply a practical side to school life and a training in elementary agricultural science.

Regular and systematic instruction has yet to be provided, and steps are likely to be taken at an early date to meet this requirement.

7. To act as a medium for bringing improved and new varieties of cultivated plants to the notice of the village population.

Superior varieties of existing vegetables and fruits, as well as new kinds, are continually being brought to the notice of the vil-

lage cultivator through the gardens, and new cultivations are often traceable to their influence.

8. To serve as centres for the dissemination of seeds and plants, and of information concerning them.

Propagating media are freely given away to school boys, and applications from villages are frequent. The work of seed dissemination is thus going on at every established school garden.

9. To be a medium of communication between the agencies that work for agricultural improvement and the cultivating classes.

In this connection the Ceylon Agricultural Society, which is greatly interested in school gardening, has done much.

10. To induce the villager directly, or through the school boys, to adopt better methods of cultivation.

This work must necessarily be of slow progress, and though at this stage it is too soon to expect any striking results, there is a tendency for the methods adopted in school gardens to be taken up in the villages.

11. To give to the village youth a bent for agriculture, and reconcile him to a country life.

A system which combines practical horticulture with class studies must, as a matter of course, counteract any tendency for book-learning to take the village youth away from the land.

12. To encourage school boys to establish gardens in their homes.

A large number of home gardens have already sprung up in connection with school gardens.

The work on the gardens is encouraged by the offer of awards to the best work.

JOHNSON, A. A. **County Schools of Agriculture and Domestic Economy in Wisconsin.** — *U. S. Dept. of Agric., Office of Experiment Stations, Bulletin* 242. Washington, 1911. **469**

United States: Wisconsin

Probably no movement in education has received as much attention in the past few years as has that which pertains to the practical phases of farming and home making. The importance of this movement can easily be seen when consideration is given to the decreasing fertility of agricultural lands in the United States during the last 20 years and the relative decrease in farming population. From recent investigations it was found that probably 60 million people live in cities and 31 million remain on the farm, when only a few years ago the bulk of the population resided in the farming districts.

Formerly practically all the food and much of the clothing used by the farmer and his family were produced in the home, the homes themselves being built with trees from the neighbouring forests. Now these conditions have changed and the realization of the educational loss occasioned by the transfer of these domestic industries to factories in cities, and the growing need of something to take their place in the educational system, has brought about the establishment of practical schools of agriculture and domestic economy.

Of the more firmly established schools of this nature may be mentioned the Congressional District Agricultural Schools of Georgia and Alabama; the Judicial District Agricultural Schools of Oklahoma; the four District Agricultural Schools of Arkansas; the Agricultural High Schools of California, Minnesota, and New-York; and the County Agricultural Schools of Wisconsin and Michigan. All these schools have one common object, that of dignifying farm labor and teaching boys and girls the industries which are now so rapidly vanishing in the rural homes of America.

Wisconsin was the first State in the Union to organize a county school of agriculture and domestic economy. The following 5 schools have been established since 1901, Wansau, Menominee, Winneconne, Mariette and Onalaska.

These county schools are, strictly speaking, agricultural trade schools and have for their sole object the educating of the farmers' boys and girls who do not wish to take up an extensive college course, but who are anxious to get that form of training which will be most useful to them when they take charge of the home farm.

The school is made the educational center of the community, and the farmers are free to call upon it for assistance in any line of work pertaining to farming and home making.

Being of the trade school type, these schools do not prepare students for the State University or the College of Agriculture.

The course of study covers a period of two years of eight months each.

Each school receives support from the State amounting to $ 4 000 a year.

All schools require for entrance that students shall have completed work equal to the eigth grade, admitting also students from outside of their respective counties.

Institutes of various kinds are conducted at each of these schools.

The following are some ways in which these schools help the farmers:

Prepare plans for farm buildings.

Make suggestions for remodeling old buildings.

Build forms and supervise the construction of cement silos, watering troughs, and similar structures.

Test all kinds of dairy products.

Assist in the selecting of farm animals.

Plan drainage systems.

Test farm seeds for germination.

Test cattle for tuberculosis.

Test soils.

Recommend systems of rotation.

Twenty-four silos of solid concrete were created in various parts of Dunn County during 1909 under the supervision of the school of Menominee.

The total enrolment for the year 1910-11 in these county schools has been about 400 students.

From present indications, Milwaukee County will probably have one of the largest and best-equipped schools of agriculture and domestic economy in the country. The county has purchased 400 acres of land, costing $ 110 000 for a school site and farm. Plans have also been completed for the erection of buildings costing approximately $ 200 000.

The La Crosse County School at Onalaska has the following courses for agriculture and domestic science.

Agricultural Course.

Junior year.

Fall term: dairy husbandry; farm arithmetic; carpentry; breeds of farm animals; stock judging; physics; military drill; physical training.

Winter term: dairy sanitation and testing cattle for tuberculosis; English; farm arithmetic; carpentry; physical training; breeds of farm animals; stock judging; physics; military drill.

Spring term: farm botany; drainage and road construction; farm machinery, including gas engines and steam traction engines; English; civics; poultry, with use of incubators; military drill; physical training.

Senior year.

Fall term: soil physics; forge work; animal breeding; chemistry; English; military drill; physical training.

Winter term: soil physics; forge work; chemistry; mechanical drawing; blue-print making; English; military drill; physical training,

Spring term: orcharding and spraying; feeding farm animals; field crops; birds and insects; farm management; concrete construction; military drill; physical training.

Domestic Science Course.

Junior year.

Fall term: cooking; sewing; food study; English; home arithmetic; physical culture.

Winter term: cooking; sewing; food study; English; home arithmetic; physical training.

Spring term: cooking; sewing; English; laundering; hat trimming; floriculture and vegetable gardening; physical culture.

Senior year.

Fall term: cooking; sewing; English; household management; physical culture.

Winter term: cooking; sewing; English; care of the sick, and emergencies; physical culture.

Spring term: cooking; sewing; woodwork; household art; physical culture.

AGRICULTURAL SHOWS AND CONGRESSES.

470 Perrot. **Colonial Exhibition and Lectures, in Holland in 1912.** (Enseignement colonial et exposition coloniale en Hollande en 1912). — *La Quinzaine Coloniale*, No. 1, p. 2. Paris, 10 Janvier 1912.

Netherlands

At the present moment Holland is greatly interested in colonial instruction, not only in the colonies themselves but also in the mother country. It has therefore been decided to found an Institute at Daventer for the purpose of training colonial planters. A colonial exhibition of agriculture will be opened there in 1912, during the course of which lectures will be given on Colonial Agriculture and Economics.

International Exhibition of Rice-Growing and Irrigation. — *Il Giornale di Risicoltura*, Anno II. No. 2, p. 18. Vercelli, 15 Gennaio 1912. 471

Italy

An International Exhibition of Rice-growing and Irrigation, as well as the IVth International Rice-growing Congress, will be held at Vercelli, in the province of Novara, Italy, during October and November, 1912.

MATENAERS, F. F. **Competitive Trial of Modern American Farm Tractors at Winnipeg, Canada, in the Autumn of 1911.** (Prüfung und Wettbewerb moderner amerikanischer Farm-Traktoren bei Winipeg im Canada in Herbst 1911). — *Deutsche Landwirtschaftliche Presse*, 39. Jahrgang, No. 5, pp. 41-42. Berlin, 17. Januar 1911. 472

Canada

During last autumn a ploughing competition with tractor engines was held at Winnipeg in Canada. 30 different types of engines took part, working with gasoline, petroleum or steam. During the first week of the trial the serviceableness of the machines as a stationary source of power for shafting work was tested. In the second week the ploughing competition proper was held on a tough prairie soil which had never been previously ploughed.

The costs of fuel per acre in the case of gasoline engines range from 23.5 cents in the cheapest engine to 74.2 cents in the dearest. The price taken for gasoline is 15 cents per gallon.

With the petroleum machines the lower limit of fuel cost per acre was 28 cents and the upper limit 46.8 cents, reckoning 1 gallon of petroleum at 12 cents. Therefore the difference was very much smaller than between the different gasoline engines.

The working capacity per hour was in four instances more than 2 ½ acres; two machines ploughed less than 1 acre per hour; the remainder were between these two extremes in their output.

Generally the work of the machines was satisfactory in a high degree.

Fourth National Congress of the Agents for Eggs, Poultry, Game, etc. at Moissac, Tarn-et-Garonne, France. 2nd and 3rd March 1912. (4e Congrès national des Expediteurs d'Oeuf, Volaille, Gibier, etc, à Moissac). — *Revue d'Aviculture technique et commerciale*, 4e année, No. 31, pp. 1-2. Paris, Janvier, 1912. 473

France

This Congress, organised by the Federation of the French agents for eggs, poultry and game with the co-operation of the Agents'

Syndicate of the Tarn-et-Garonne and adjacent Departments, will be held at Moissac on March 2nd and 3rd 1912.

The following are the matters to be dealt with by the Congress: the law of 1896, and central markets; the town-dues, their reimbursement on leaving the town, or their total suppression; high cost of living; questions of transport.

CROPS AND CULTIVATION

AGRICULTURAL METEOROLOGY.

474 BROUNOR, P. I. **Weather Forecasting.** (Stranitcka is Nieistrumentalnikh Meteorologhiceskikh Nablindenii). — *Xurnal Opêtnoi Agronomii.* — (Review of Experimental Agriculture). G. XII, Kniga 6, pp. 924-925; S. Peterburg, Dekabr. 1911.

Russia

This is an interesting contribution to the study of weather forecasting, based on direct observation of meteorological phenomena, without the use of special instruments. The writer is convinced that mirages, fogs, and halos round the planets, may announce a distinct type of weather, and he explains this relation by the data supplied by synoptic charts, reinforced by numerous personal observations.

Thus the dense fogs that come from the sea he considers to be a sign of lasting fine weather. They owe their origin to, and are driven by, the hot winds, which as they blow towards the cold coasts, bring about a sharp temperature gradient, and are the certain indication of the approach of an anticyclone.

The mirages noticed along the bay of Hungerberg precede bad weather, but always with an interval of one or two fine days. The formation of mirages is clearly explained by the study of synoptic charts: (1) to the south of Hungerberg there occurs an area of minimum pressure (cyclone); (2) the water temperature in the Gulf of Finland is rather high; (3) the cyclone proceeding towards the

north and constantly approaching the Bay of Hungerburg (on the Gulf of Finland) attracts in that direction the cold winds from the north-east, and when the cyclonic area lies in the immediate neighbourhood of Hungerburg, the north-east air currents pass over the eastern extremity of the Gulf of Finland, and the great difference of temperature between the water and the atmosphere brings about the well-known phenomena of abnormal refraction.

The golden sunsets, the alto-cumuli which make the sky look like marble, and appear to increase its depth, are signs of the approach of maximum pressures, and hence of lasting fine weather. The rose-coloured clouds with silver edges, and the large luminous rings round the sun indicate the same.

Halos as a rule are signs of bad weather, because they mean cold atmospheric strata not very high up, — a state of things which during the summer takes place in cyclonic areas.

KLEIN, P. **A New Service of Agricultural Meteorology in France.** (Un Nouveau Service de Météorologie Agricole). — *La Vie agricole et rurale*, No. 7, pp. 169-170. Paris, 13 Janvier 1912. **475**

A new service of agricultural meteorology will shortly be established in France.

THE PRESENT METEOROLOGICAL SERVICE.

The projected service will collaborate with the general meteorological service established in 1885 on the initiative of the astronomer Leverrier. The latter includes a central office in Paris, and stations in all parts of France. Every day the central office receives telegrams both from the French, and from foreign, stations. From the information received a chart is prepared which shows the distribution of the different atmospheric elements, and from this a relative forecast of the weather is drawn up. In order to facilitate the forecast, France has been divided into eight districts; north-west, north, north-east, west, central, east, south-west, south; for each of which a special forecast is made. **France**

But this division into eight districts is not sufficient, because the features of the land may cause very different weather in neighbouring places: hence they can only supply indications of a very general kind. The forecasts made for twenty-four hours are sent by telegram both to individuals and to societies; they are also published in the daily papers, but the time required for this prevents the forecast reaching the public in time to be of much use. There

is also a service of climatology connected with the Central Office. Its work is to collect and publish periodically all the data (atmospheric pressure, temperature of the air, etc.) connected with general climatology.

But the Central Office in not all. In certain districts, namely, Cadillac, Carcassonne, Châlons-sur-Marne, Clermont-Ferrand, Condom, Montpellier, Narbonne, Perpignan, there exist secondary services of agricultural meteorology, due to private initiative. These receive from the Central Offiee the weather forecasts, deduce the probable consequences as bearing on the crops, etc., and communicate the same to their subscribers.

Organisation of the New Service.

The new service will be directed by a Committee, assisted by technical experts. They will determine the observations to be made, and collect and work out the data.

The mass of materials thus brought together will make it possible to determine precisely the influence, as yet little known, of the different atmospheric forces, and hence deduce the agricultural *modus operandi* most suited to the different meteorological situations.

District Stations.

These stations will be established in the centre of districts characterised by the similarity of their atmospheric conditions, and will, as far as possible, be attached to observatories, schools of agriculture, etc., already existing.

For this purpose it is probable that the following places will be selected: Bagnères-de-Bigorre, Besançon, Bordeaux, Clermont-Ferrand, Dijon, Lille, Lyon, Marseille, Montpellier, Mount Aigonal, Nancy, Nantes, Poitiers, Perpignan, Rennes, and Toulouse. They will receive by telegram every day about noon from the Central Office a somewhat detailed account of the actual state of the atmosphere for the whole of the Continent and the probable course of the weather. By means of this information, and with due regard to local conditions, they will each draw up a special forecast for their own district, which will then be transmitted to the secondary stations dependent on them.

Stations of information and Warning.

These stations will be as numerous as possible and stand in direct relation with the country people. They will be directed by

agricultural professors or instructors, who as soon as they have received information from the district stations to which they belong, will transmit the same to the farmers in the form of clear and practical advice. They will give warning of unexpected events (*e. g.*, the approach of a storm, or of frost) with the use of all available means, such as placards, optical signals, drums, and trumpets. Those farmers who wish will receive by telegram these warnings for a small charge.

AGRICULTURAL POSTS.

These posts will be attached both to the district stations and to the stations of information. They will be provided with all the instruments required for making daily observations in agricultural, as well as in pure meteorology. These observations will be sent, the former to the technical Service, and the latter to the Central Bureau, to be used for drawing up the charts.

The new service will include such a large number of stations that the whole country will benefit from the information collected. It is obvious that the whole organisation can only be carried out progressively, but when once completely established, the timely information and warning which it will afford cannot fail to be of the highest use.

XARISOMENOV, C. **The Influence of Rain and of Atmospheric Temperature on the Cereal Crops in the Governments of Saratov, Samara and Tambov.** (Vliianie Osadkov i Temperaturi Potevina Wroxai Khliebor Sarat-Samarskoi i Tambowskoi Gub. — *Jurnal Opetnoi Agronomii* (Review of Experimental Agriculture). G. XII, pp. 927-928. S. Peterburg, 1911. **476**

Russia

The author draws many interesting conclusions from a comparative study of the year-books of the Central Physical Observatory and of the statistics of the Department of Agriculture respecting the influence of meteorological conditions on the quantity and quality of the harvests.

The data used were collected during a period of 25 years and deal with the cultivation of cereals, forage plants, and potatoes from the point of view of the effect of rain and the temperature of the atmosphere.

The following are some important conclusions :

Increase of rain in winter is accompanied by a parallel increase in the crops ; abundant rainfall in November, December, January,

February and March are beneficial to all cereals, but heavy rains in April are on the contrary very injurious to them.

Increased rainfall in August, September, October, and April causes a decrease in the crops of spring cereals, while winter cereals and perennial forage plants are not harmed.

The explanation of the good and bad effect of rain must be sought for in pedology and in vegetable physiology.

The effect of capillary action is the principal cause of the damage wrought by rain. A detailed description is given of the movement of water in the soil during the different seasons of the year.

In the district of Saratov, as the temperature is below the optimum in autumn and winter, and above in June and July, it follows that during both these seasons the nitrification processes are retarded and hindered.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY.

477 **Agrogeological Map-Making.** Björlykke, K. O. Über agrogeologische Kartierung. — *Verhandlungen der Zweiten Agrogeologenkonferenz*, pp. 290-298. Stockholm, 1911.

Blanck, E. Über die Bedeutung der Bodenkarten für Bodenkunde und Landwirtschaft. — *Fühlings Landwirtschaftliche Zeitung*, 60. Jahrgang, Heft 4, pp. 121-145. Berlin, 1911.

Hall, A. D. and Russell, E. J. Soil Surveys and Soil Analyses. — *The Journal of Agricultural Science*, Vol. IV, Part 2, pp. 182-223. Cambridge, 1911.

Sweden, Germany, England

The most important preliminary to agrogeological map-making is the clear definition of the limits of agrogeology and of geology proper.

What is the distinction between an agrogeological and a geological map? The present condition of pedology permits of more than one clear definite reply to these questions, which place the problem in its proper light.

The scope of the ordinary geological map is the definition and limitation of the formations as a whole, little stress being laid upon the facies in the different localities.

In soil maps, on the contrary, the facies are the most important, since the value of the various soils, from the agricultural point of view, depends upon their petrographical composition.

As an example of this may be mentioned the delta-formations, which although geologically of similar origin, yet present a great variety of soils from an agricultural stand point. Further, while the geological map has chiefly to do with the subsoil (the result of the disintegration of the rock-floor) the agrogeological map concerns itself chiefly with the superficial layer, which, as a result of weathering and decomposition, forms a suitable stratum for plant-growth. A third difference is, that the geologist studies the various formations from the point of view of the time and mode of their occurrence, while the agrogeologist is only concerned with the agricultural value of the soil and the manner in which it can be turned to the best practical use at the present time.

Thus, while on the one hand, agrogeology or pedology is an independent science but closely related to geology, on the other, it is an applied science, whose aim is to make clear the relation between the inorganic and the organic world — and especially to explain the relation between cultivated soils and the plants grown upon them.

But for this, we must go back to nature, types of soils must be studied in the field, not in the chemical laboratory, their differences must be distinguished and their properties understood.

Amongst the various methods of agrogeological map-making adopted in different lands, the best is in all probability the one adopted by the United States Division of Soils.

According to this method, not only are the different soil types distinguished upon the map, but notes are added in which the different kinds of soil are considered in relation to their adaptibility to the agricultural needs of the districts in question

The description of the soil of a district should comprise :

1. A geographical and orographical review.

2. A review of the climatic conditions.

3. A summary of the conditions of agriculture and of the allied branches of industry in the district.

4. A geological map of the district.

5. A more detailed description of the different soil types, their physical and chemical properties, and their relation to cultivated plants or to the vegetation of the district in general.

6. A review of the future possibilities of agriculture in the district, with regard also to the areas which are capable of cultivation, though at present untilled.

The chief difficulty in such researches is the determination of the different types of soil. Upon what should such distinctions be based? It should be noted that climatic divisions, though of geographical interest, have in practice a very limited utility. It is necessary for the pedologist to distinguish between the most important soil types in limited districts where the climatic conditions are comparatively uniform.

Therefore the most important basis of classification is the physical property of the soil which depends chiefly upon mechanical composition, which is partly the result of its geological origin, although other factors must be included, *viz.* chemical composition, topographical and geotechnical conditions.

From the topographical point of view, different types of soil can be distinguished: terraces, lacustrine deposits, etc. The chemical composition often has considerable influence upon vegetation.

Soil rich in humus can be divided into types according to the plants from which the peat is formed, the stage of their decomposition. Mechanical analysis is however of supreme importance in the classification and characterization of the types of mineral soils.

The first aim therefore is to distinguish the different kinds or types of soil which occur in nature, and to explain their occurrence from their situation and by the help of sections. Samples must be taken both of the subsoil and of the soil, and submitted to chemical and mechanical analysis in the laboratory.

The above mentioned method of mapping and describing the soil types of limited areas is of course only preliminary work. When this has been done for the different districts, it will be possible to make a survey map of the whole district, coordinating the information collected with the climatic and meteorological factors.

The recent pedological researches tend to render the science of agrogeology more complete, and make soil maps more exact and richer in details.

The American workers have devoted themselves with much zeal to what may be called the study of the physical types of soil. Their researches however need much time, being based upon the average results of experiments lasting many years.

The study of the microorganisms of the soil will probably yield important information respecting the different types, but this study has so far made little advance. Pedology is still in its infancy, many important questions still await an answer.

Conditions are naturally not the same in different countries.

There are some countries where it is possible now to begin with a physiological examination of the different soil types — the

climatic and petrographic conditions being so clearly defined and uniform, but in countries like Norway the petrographical and climatic conditions are so varied, that the preparation of a survey map will be a long and laborious task, although Norway's division into districts is helpful.

Norway is divided into 18 districts, nearly all of which have their own agricultural school and separate agricultural officials. A partly private society has formed a Central Committee for soil research.

This Committee consists of the Agricultural Professors of the Agricultural High School and has elected as their third member a practical agriculturist.

The material collected by various collaborators (Professors of Agriculture, etc.) is submitted to the Central Committee and published.

These soil descriptions are only preliminary work, but it is hoped that they will afford the necessary data for the drawing up, in the future, of agricultural and descriptive maps of the whole country.

The agrogeological maps might be divided into two divisions:

1) Agrogeological survey maps (general).
2) Detailed Agrogeological maps.

The general survey maps can be divided into:

a) District maps.
b) Regional maps.

In drawing up the scheme of work, it is best to begin on a small scale with districts and communes, afterwards proceeding to the construction of a general descriptive map of the whole country, or a large part of it, adopting an international scheme of colours and terms.

DE MIKLASZEWSKI, SLAVOMIR. **Types of Soil and their Importance.** — *Verhandlungen der Zweiten Internationalen Agrogeologen Konferenz*, pp. 276-278. Stockholm, 1911. **478**

In the classification of the different types of soil, the Russian agrogeologists subordinate all pedological principles to the single one of climate.

But there are many cases which cannot be explained from the point of climate alone. **Russia: Poland**

The climatic factor does not account for the fact that sterile and poor zones alternate with fertile and rich zones where the climate and geological formation are the same, although it is the most

important when vast, but geologically homogeneous, regions are the subject of study, as it affords a method of explaining all the differences between the various geographical groups of the soils under examination.

But as soon as it is a case of the description of less extensive regions, in which often many geological formations are represented, we find ourselves confronted by questions which cannot be answered by reference to climate alone.

This is almost always the difficulty which the pedologists encounter in districts rich in geological formations, but too restricted in extent to have much variation in their climate. The same difficulty will also arise in the case of more extensive and uniform regions when, having traced ont the climatic zones, it is necessary to elaborate a more detailed classification. It is the latter alone which is of importance from the agricultural point of view.

It is necessary to establish agricultural types, types of soil, that is to say, which although uniform from the climatic standpoint are, nevertheless, variable from the point of view of cultivation.

Many natural factors take part in the formation of a soil, and the typical pedological characters are those which are determined by the dominant factors.

In those zones which do not consist of types of soil, but of groups of typical soils, climate doubtless is the dominant factor; it is rarely so, however, where the formations are varied.

Thus, in the case of the soil group known as *rendzina*, we have in the cretaceous soil three different types, black, white, and yellow, which are similar from the climatic and geological point of view (being derived from the marl and limestone of a single formation) but which vary much and are of very different value as the constituents of arable land.

Therefore, in all pedological research, it should be borne in mind:

1. The different types of soil have typical pedological characters due to dominant factors, (differing in the case of each; and which it is always necessary to determine, although very often climate is the dominant factor.

2. In the case of the unequal fertility of two apparently similar types, it should be suspected that the right dominant factor has not been discovered, for there are many natural factors of which we know little, or even nothing.

3. All types of soil, however determined, require special me-

thods of examination and, being different, should be investigated separately.

4. The results of physical or chemical experiments, although obtained by the same methods, can only be compared in the case of the same types of soils.

TOLSKII, A. P. **Observations on the Penetration of Heat in the Soil in Busulusk, Government of Samara, Russia.** (Is Nabliudenii nad Temperaturoi Pocvi v Busulkskom Born Samarskoi Gub). — *Jurnal Opetnoi Agronomii* (Review of Experimental Agriculture) G. XII, Kniga 6, pp. 919-920. S. Peterburg, 1911. 479

This article gives the results of numerous experiments made by the writer at the meteorological station of the experimental forest of Borov, upon the distribution of temperature in the soil in relation to the flora, the relief, the working and qualities of the soil, the snow covering, etc. Russia

During winter, the soil is warmer in the woods than in open districts, in fact, the layer of frozen soil has, in the first case, a thickness of one metre (3 ft. 2 in.) and in the second, attains a depth of 1.50 metres (5 ft.).

In summer, on the contrary, the reverse is the case, and the maximum difference in temperature may be 5°C. (9° F.) in exposed soils. A covering of snow has a wonderful effect upon the freezing of the soil: for while the frozen stratum may be 2 metres (6 ft. 6 in.) deep in uncovered places, it generally does not exceed 1 metre (3 ft. 3 in.) where there is a covering of snow.

As for the influence of relief, it has been proved that the summits of the dunes part with their heat and regain it more quickly than do the slopes and the valleys between them.

Working the soil has a direct influence upon the temperature: soil dug or ploughed acquires much more heat than ground which has been left fallow. If the latter is denuded of turf the relation changes, showing that the lowering of temperature in the former case is due to the grassy covering.

CZERMAK, W. **Modification of the Pysical Properties of the Soil under the Action of Frost, Heat, and certain Salts.** (Ein Beitrag zur Erkenntnis der Veränderungen der sog. physikalischen Bodeneigenschaften durch Frost, Hitze, und die Beigabe einiger Salze). — *Die Landwirtschaftlichen Versuchs-Stationen*, Bd. LXXVI, H. I and II, pp. 75-116. Berlin, 1911. 480

The modifications of the physical properties of the soil have an important bearing on its structure and on its capacity for absorb- Germany

ing and accumulating nutritive matter for plants; for these modifications may set up conditions favourable to the life and growth of the roots.

Under the soil's physical properties the writer chiefly considers from this point of view its tenacity and its capacity for absorbing water.

These properties, as Mitscherlich (1) has shown, are closely connected with the surface of the soil, *i.e.*, with the sum of the surfaces of its particles; and as this surface is in its turn connected with the soil's hygroscopicity, the determination of the latter gives an idea of the two above-mentioned properties. In order to determine the hygroscopicity in his experiments the writer used the method of Rodewald and Mitscherlich (2), only modifying it so far as to secure a perfect desiccation of the material examined. Mr. Czermak also determined the amount of soluble nitrogen in differently treated soils, and proceeded to experiment with plants in pots, using oats.

Experiments were made on the action of cold by means of a refrigerating apparatus at a mean daily temperature of from 4° to 6° C. (39.2° to 42.8° Fahr.), during 4 to 8 weeks. The action of heat as effecting sterilisation was tested twice, for two hours, at a pressure of from 1.5 to 2.5 atmospheres. The salts experimented with were calcium chloride and aluminium sulphate and in the plant experiments, calcium chloride and thorium chloride.

In the latter experiments an electric current of 0.025 amperes was employed, in order to prove the possible electrolytic action of the salts used as electrolytes. The soil chosen for these researches was a tenacious loam.

The following considerations, which are of general practical importance, may be deduced from the results obtained.

1. As regards the action of cold or of frost (the importance of which every farmer well knows, without any experimental or scientific study of the phenomenon), it induces a shrinkage of the soil surface through the coagulation of the colloids. Its duration and the changes of its action are determinative in this respect. As the colloids thus coagulated absorb a portion of the dissolved plant food-stuffs, the latter decrease under the action of cold or frost.

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(1) See E. MITSCHERLICH, *Bodenkunde für Land- und Forstwirte*, S. 87,98. Berlin, 1905. (*N. d. R.*).

(2) See *B.* Nov. 1910, pp. 23-24. (*Ed.*).

2. The action of heat also induces a coagulation of the colloids, and consequently a shrinkage of the soil surface; on the other hand it increases the solubility of the nitrogen, which is however brought about by a purely chemical reaction.

3. The coagulation, and in consequence, a shrinkage of the soil surface, are also caused by electrolytes.

D'ANDRIMONT, R. **The Principles of the Circulation of Water in Tilled Soils and their Application.**—(Les principes de la circulation de l'eau dans les terrains meubles et leurs applications).—*Verhandlungen der zweiten Internationalen Agrogeologenkonferenz*, IV, pp. 117-124. Stockholm, 1911. 481

According to the writer, the water contained by a tilled soil can be present in the four following conditions:

1) *Capillary Condition.* The water fills all the interstices and, further, each soil particle adheres to its neighbour by means of a layer of water which exercises a capillary attraction. At the exact point of capillary saturation, the mass of soil and water shows a certain cohesion and the water does not percolate.

2) *Intermediate Condition.* When through trituration, the conditions are altered of a soil completely saturated with a quantity of water corresponding to the volume of the spaces between the particles, these spaces increase, and the water is no longer able to fill them. The water then retires and the soil particles are merely united by small drops of water; further, the particles are enclosed by a film of liquid continuous with the drops. But the air circulates between the particles and the drops.

In this condition, certain soils lose their plasticity while still retaining a certain cohesion.

3) *Pellicular Condition.* When soil is continuously worked, it dries rapidly on account of the circulation of the air through the mass. The dimension of the droplets of water which unite the soil particles decreases to the point where capillary attraction ceases, and the water exists then in the state known to physicists as "superficial condition" and which we call pellicular, that is to say, it forms an invisible covering to the particles, but the soil has still a humid appearance. In this condition the particles adhere to one another as long as the film retains a certain thickness, but the soil has entirely lost its plastic property.

4) *Apparently Dry Condition.* If soil is dried still further, there is no longer sufficient water to cover the particles and produce adherence, for it retires into their microscopic cracks and minute

cavities; the water content of the soil, in such a case, depends upon the mineralogical nature of the particles.

From further remarks of the author, it is clear that the soils which plant roots reach are generally saturated with water in the pellicular state, except in the following cases where the imbibition is capillary.

a) In the case of the first few centimetres below the surface, after fairly heavy rain, but this capillary imbibition does not however continue.

b) In less absorptive strata, such as exist at a slight depth.

c) At the level of the water-containing strata, or where these are situated little below the surface.

From this it may be deduced, that it is not enough to study, as is usually done, the maximum absorption capacity of the soil (capillary condition) but also the method of the water circulation in the pellicular condition. A plant lives upon water and the nutritive substances dissolved in the latter, and thus diminishes the thickness of the pellicular layer in its immediate neighbourhood; as a result, the water layer spreads out evenly between the particles and makes its way particularly towards the roots. Generally speaking, it may be said that the amount of water and of the nutritive substances used by the plant does not depend only upon the water content of the soil, but also upon the velocity of the circulation in proportion to the quantity. The maximum rate of circulation does not, however, always depend upon the maximum of imbibition; this is especially the case in clay soils.

Every soil can be described by means of diagrams giving the proportion of water and the speed of its rise (capillary and pellicular). A combination of the two diagrams would give the optimum degree of imbibition for the development of a plant.

By this method, a rational method of irrigation and drainage could be established.

482 HUME, W. F. **The Study of Soils in Egypt.** — *Verhandlungen der Zweiten Internationalen Agrogeologenkonferenz*, pp. 301-319. Stockholm, 1911.

Egypt

This is an interesting article on the classification, formation, and quality of the soils of Egypt studied from the points of view of:

1. The Climatic Factor.
2. The Geological Factor.
3. The Time Factor.
4. The Influence of Vegetation and Animal Life.

Climatic Factor. — The climatic question may be summed up as follows:

1) The general climatic conditions of Egypt have not undergone any sensible change in the last century at least.

2) Increased cultivation may have led to enhanced evaporation in the fertile area of the Delta, making the relative humidity conditions probably higher in some parts.

3) It is desirable that careful meteorological records should be kept, not only in large towns, but also in certain areas typical of great agricultural centres.

The Geological Factor. — The geological factor in Egypt appears simple at first; nearly the whole of the agricultural land has been deposited from the Nile, and is only in small degree dependent on the geological structure of the desert regions bordering its valley. The most valuable ingredients are those derived from great masses of basaltic material from northern Abyssinia.

Sir W. Willcocks recognizes four types of soils:

1) The well-known dense black clay of a depth of over 6 or 7 metres, which is very rich, and especially suitable for cotton. Such soil has not been anywhere injuriously affected by heavy irrigation, except where the canals have been run at a high level throughout twelve months of the year.

2) A dense black clay of from 1 to 3 metres in depth, overlying sand. Wherever canals running during winter and summer at a level higher than that of the country have been introduced, a deterioration of the soil has been very marked. Where, however, canals running at a level of about 2 metres below the surface in those seasons have been introduced, the happiest results have been obtained.

3) A sandy clay, especially suitable for maize and root-crops. According to Sir W. Willcocks, the introduction into such lands of canals running at high level in winter and summer has converted the country into marshy soil.

4) An almost pure sandy or gravelly soil, occurring at various localities in the Delta itself and forming the desert edges in the Nile valley.

The soil problem in Egypt involves:

A) How best to distribute the maximum amount of water containing the soil-forming mud over the widest possible area. The effort to attain this object has involved the marked change from basin to perennial irrigation. This involves however:

B) A careful study of the changes which the soil may undergo as a result of the multiplication of canals. This question is

of greater importance than appears at first sight. In basin irrigation, though the water enters through the regulators with a rush, it is subsequently at rest in the basin, and the materials contained in it slowly settle, directly in proportion to the coarseness of their texture. The finest material is captured as a surface film. In canal irrigation, the amount of surface water containing the finest material may be relatively small in proportion to the total amount carrying coarser material. The question requiring study, is, to what extent canal irrigation tends to diminish or increase the value of the soil by diminishing the percentage of fine silt, or rather causing a more intimate admixture of coarse and fine silt.

C) A change to a coarser soil-texture would involve a rise in the water-table, and consequently an accumulation of injurious salts, but the more open texture of the soil is probably of agricultural advantage.

The geological problem in the greater part of Egypt from the agricultural standpoint is thus, the study of the characters of a river deposit, with its coarser elements near the current centres, and the finer particles deposited on the outskirts of fluviatile influence. This involves also the determinatian of old river channels, and, especially, a careful examination af any soil changes which may be effected by the introduction of canals with increased power of transport of the coarser constituents.

Analysis of Soils. — Mr. F. Hughes, chemist to the Khedivial Agricultural Society, has made an important series of soil analyses. The method adopted for determining the " total " constituents was extracting with concentrated hydrochloric acid for twenty-four hours, and for the " available " constituents Dyer's citric acid method.

Fifteen samples were analyzed, the physical analyses, chemical analyses, field-trials for cotton with varying manures and the ginning out-turn of cotton being noted. The points bearing on the soil question on which emphasis is laid are:

1) The irregularity in the quality of the soil, a very noticeable feature in Egypt and which will render a soil survey one of great difficulty in this country.

2) The relation of average yield to chemical composition of the soil has been somewhat inconclusive, though soils richer in nitrogen, soluble potash, and phosphoric acid, and also in soluble silica give a somewhat better average yield than those with less.

3) The relation of yield to the physical properties of the soil is more marked, the proportion of clay (here, taken as material with soil particles less than 0.002 mm. diameter) shows that the

five best stations gave 34.9 % of clay, the five lowest yielding 27.2 %.

The examination of the work already done on Egyptian soils leads to the following general conclusions·

1) The study of the soils in Egypt is one of the variation in river-borne materials, and especially of the relations of two extreme physical types, the sands and the clays.

2) A vertical soil survey map on the scale of 1: 25 000 would be very useful in showing where clay and sand are respectively dominant in different parts of the country, modifications being introduced as experience dictates whether the arbitrary lines selected agree best with the agricultural necessities.

3) It is especially to be wished that the soil variation should be studied where changes are being made in the supply of water, so that the agricultural development may correspond with the changes in the nature of the soil.

4) The study of the changes in salt contents, and the circumstances which lead to the augmentation or diminution of these materials in Egyptian soils is of prime importance, the possibility of the accumulation of sodium carbonate especially requiring attention in certain areas.

SCHREINER, OSWALD and SKINNER, J. J. **Organic Compounds and Fertilizer Action.** — *U. S. Dept. of Agric., Bureau of Soils, Bull.* 77, p. 31 + figs. 5 + pls. II. Washington, 1911. 483

United States

In the preface, one of the Authors remarks that the action of fertilizers is not yet entirely understood, and is not due solely to the addition to the soil of nutritive substances as such; many other factors contribute to determine the yields of crops, and these factors make the action of fertilizers more, or less, effective.

The study of these factors should then assist in establising a more definite, rational, and remunerative system of manuring.

In earlier investigations, also carried out by the Bureau of Soils (1), organic bodies injurious to the growth of plants were isolated; further experiments showed that the toxic action of dihydroxystearic acid on wheat could be modified by the action of manures (2).

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(1) SCHREINER, O. and SHORY, E. C. « The Isolation of Harmful Organic Substances from Soils ». *U. S. Dept. of Agric., Bureau of Soils, Bull.* 53.

(2) See *B.* Dec. 1910, pp. 217-218. (*Ed.*).

In the investigations now under consideration the action of coumarin, vanillin and quinone, all injurious to plants, was studied in the presence of nutritive salts in various proportions, but with a total concentration of 80 : 1 000 000.

The number of culture-solutions was 66, representing all the possible combinations of phosphoric anhydride, nitrogen (calculated as ammonia), and potash, at every 10 % of the total concentration mentioned above. One series of experiments was made with the nutritive solutions alone, and the other with the addition of 10 : 1 000 000 coumarin, 50 : 1 000 000 vanillin, and 10 : 1 000 000 quinone separately. Besides these solutions, other experiments were made in the open ground with the same nutritive materials at a total concentration of 100 : 1 000 000, with the addition of 50:1 000 000 coumarin.

In these experiments, the injurious effets of coumarin, vanillin and quinone were determined by the following criteria:

1. Diminution of the fresh weight.

2. Morphological alterations: with coumarin, shoots stunted, eaves large and twisted; with vanillin, less development of shoots and roots, with quinone, plants tall and slender, leaves narrow and delicate; with solutions of 100 : 1 000 000 the plants were killed, and with those of 50 : 1 000 000 they were severely injured.

3. Diminution of absorption of nutritive materials: coumarin lowers the absorption of potash and nitrates more than that of phosphates; quinone lowers that of phosphates more than that of nitrates and potash; the effect of vanillin was not determined.

On the other hand the nutritive salts exercised a compensating action on the injurious action of the poisonous bodies. Thus phosphates are generally most efficacious against coumarin, nitrogenous substances against vanillin, and potash against quinone.

Under normal conditions, the best development occurred where nitrates and potash together predominated; but in the presence of coumarin the best result was obtained with predominance of phosphates; in the presence of vanillin with nitrates; and in the presence of quinone, with potash.

The different actions of fertilizing materials, and, on the other hand, the different requirements in nutritive substances, show great similarity with the observations of practical agriculture as to the different manurial requirements of different soils. Considering the presence in the soil of injurious organic bodies similar to those used in the experiments, and that the composition of the organic matter varies in different soils, or even in the same soil according to conditions of aeration, drainage and cultivation, it seems evident that

the presence of such injurious bodies entails special requirements in manures. These requirements may vary with the weather, according to the nature of the biochemical processes which produce the injurious bodies, or according to the crops whose remains are left in the soil; in short, according to the rotation. the method of cultivation resulting from it, and the various crops grown.

SULLIVAN M. X. **The Origin of Creatinine in Soils**. (From the Laboratory of Fertility Investigations, Bur. of Soils, U. S. Dept. of. Ag.). — *The Journal of the American Chemical Society*, Vol. XXXIII, No. 12, pp. 2035-2042. Easton, Pa., December, 1911. **484**

United States

The presence of creatinine in soils was first demonstrated by E. C. Shorey, who extracted it from various soils by means of dilute alkali. The creatinine of the soils might have its origin:

1) as a result of metabolic activity of micro-organisms;

2) from stable manure introduced into the soil;

3) from the disintegration of plant debris and the direct passage from the living plant.

The particular phase of the question of the origin of creatinine in soils, which is considered by the Author, is its presence in plants and consequently in plant debris, and the passage of the creatinine into the soil, either by disintegration of the plant debris, or as a result of cell sloughing, or direct excretion from the living plant.

As shown in the present paper, creatinine was found in the water and water-glycerol extracts of planted soils as well as of soil which had not been recently cropped; but was present in larger amounts in the recently cropped soil, thus indicating that the appearance of creatinine was connected in some way with plant growth. Creatinine was also found in the water in which seedlings had grown. It was found also in wheat seeds, wheat seedlings, and wheat bran, in rye, clover, alfalfa, cowpeas and potatoes. If, as is suggested by several investigators, creatinine in the animal arises as the result of the breaking up of albumin, then it seems reasonable to expect that creatinine would be found in practically all plants.

Though the amount of creatinine and creatine (1) in vegetable matter is small, it is worthy of attention, since by the decay of

(1) Creatinine is the anhydride of creatine, an organic nitrogenous constituent of muscle, which is found also in blood and urine. (*Ed.*).

plants, green manures, etc., and by direct cell sloughing or even by osmosis, the creatinine and creatine are left in water and soil, where they exercise an effect on subsequent plant growth. Creatinine seems ro persist for a considerable time in soils and may increase by accumulation.

Since both creatine and creatinine have a favorable effect on plant growth, their presence in plants and in the medium in which plants grow has considerable bearing on soil fertility (1).

485 RUSSELL, E. J. and PETHERBRIDGE, F. R. **Partial Sterilisation of Soil for Glasshouse Work.** — *Journal of the Board of Agriculture*, Vol. XVIII, No. 10, pp. 809-826 + figg. 7. London, January, 1912.

United Kingdom

The favourable conditions of warmth, moisture, and food which the grower under glass secures for his plants, encourages also a host of other living things, animal and vegetable. But recent experiments on partial sterilisation have shown that it is possible to greatly reduce the number of these organisms (2).

The practical application of the methods to be employed are described in detail in the paper under review, and the following conclusions are reached:

1. Partial sterilisation of soil increases the supply of food for the plant, somewhat alters the growth of the plant, and kills insect pests.

2. It may cause a temporary retardation in germination and in early growth, the amount of which varies according to the nature of the soil, the seed, and the general conditions.

3. In these experiments it did not prove advantageous for pot work, where abundant supplies of clean virgin soil and manure are available.

4. It is, however, very useful for work with borders, cold frames, and for plants that are to run for some time without manure. It leads to better root development, sturdier and healthier plants. earlier flowering, more prolific fruiting, and better quality of fruit.

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(1) See also: SCHREINRR, O.; SHOREY, E. C.; SULLIVAN, M. X.; SKINNER. J. J. A Beneficial Organic Constituent of Soils: Creatinine. *U. S. Dpt. of Agr. Bur. of Soils, Bull. N.* 53, pp. 44 + pl. III + Hb. VII, Washington, 1911. — In appears too, according to Skinner that creatinine and creatine can replace the effect of nitrate in plant growth. (*Ed.*).

(2) See *B*, Jan. 1912, No. 45.

5. It is particularly useful for commercial glasshouses where soil pests are a source of trouble, and soil « sickness » sets in.

6. At present the most effective method of partial sterilisation is to heat the soil to a temperature above 140° Fahr., but not exceeding 212° Fahr. Very satisfactory results have been obtained between 180° and 200° Fahr.; ½ cwt. or less fuel is required per ton of soil; capital and labour charges depend on the speed at which the process is to be worked. The experiments showed that effective chemical treatment (with coal-tar products) is also possible, and would be much simpler, but Messrs. Russell and Petherbridge have not yet tested a sufficient number of commercial products to be able to discuss the problem from the grower's point of view.

There are two methods of sterilisation by heat: 1) *Steam Heat*; 2) *Dry Heat*.

With *steam heat* the most economical pressure has yet to be determined.

When the pressure was at 80-90 lb. the total cost worked out at 1*s* 6*d* a cubic yard (20 cwt. being reckoned to the cub. yd.). With low pressure steam the cost was 1*s* 2*d* per ton (no allowance being made for the boiler).

With *Dry Heat* there is: 1) the oven method; and 2) the hot-air method. With the former, the heating is irregular and the reverse of economical. With the latter, though there is a certain amount of waste, yet the great advantage is that it can be worked by means of the waste heat from the flues, at a cost of only 5*d* per ton.

The amount of water in the soil is a very important factor in determining the cost of the process. For this reason the writers give a formula by which an approximate estimate of the number of thermal units can be made, if the amount of moisture be known.

Multiply percentage of dry soil (*i. e.*, 100 *minus* percentage of moisture) by 23 for a rich soil, or 21 for a poor one, *add* 100 × percentage of water, *multiply* by 1.6, and *divide* by 100; thus:

$$\frac{[(S \times 23 \text{ or } 21) + (W \times 100)] \times 1.6}{100}$$

Where S = percent. of dry soil, and W = percent of water. The rule breaks down for dry soils. The number of pounds of soil heated per lb. of fuel burnt (100 % efficiency) is obtained by dividing the B. T. U. (British Thermal Unit) into 12 000, the calorific power of average quality coal.

The highest degree of efficiency yet observed is about 30 %, *i. e.*, 57 ½ lb. of soil heated per lb. of fuel, the cost being 3 ¼*d*. per ton of soil sterilised.

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

486 KRÜGER E. (Chief of the Division for Agricultural Improvements, at the Kaiser Wilhelm Agric. Institute at Bromberg). **Irrigation of Fields**. (Ueber Ackerbewässerungsanlagen). — *Deutsche Landwirtschaftliche Presse*, XXXIX Jahrgang, No. 3, pp. 21-22; No. 4, pp. 29-32. Berlin, 10 and 13 Januar 1912.

Germany

The drought of 1911 increased the interest in the experiments on field irrigation undertaken by this division for Agricultural Improvement, and the Institute received many requests for information to which the writer replied by the publication of an interesting résumé of his researches. The following are the most important data.

I. PRINCIPLES TO BE OBSERVED IN THE INSTALLATION OF FIELD IRRIGATION WORKS.

1. *System of Irrigation.*

In America, field-irrigation is still generally carried out by means of channels of irrigation.

The population being scattered, there is a copious supply of water, and waste of this commodity is therefore pardonable. Thus 7 500 cub. m. of water per ha. (100 000 cub. ft. per acre) or sometimes even 20 000 cub. m. (285 000 cub. ft.), *i.e.* 2 000 mm. (80 in.), are used per annum.

This enormous amount is necessary on account of the loss of water, by infiltration consequent on the channel irrigation method. It is not therefore possible for the water to be equally divided over the surface of the field to be irrigated.

Such loss of water cannot be permitted where the supply has to serve for various purposes.

The loss by infiltration in the case of light soils, which require the most irrigation, is enormous. Therefore the channel irrigation system is only advantageous on very gentle uniform slopes of great extension, such as occur in America. These conditions do not obtain in east Germany where the surface of the ground is very

uneven, and where irrigation is best carried out by spraying water under pressure. This system is suitable for every type of surface, and the water-supply is used to far better advantage than in the case of irrigation channels, as was proved by the writers' experiments.

2. *The Necessary Amount of Water and its Sources.*

The necessary amount of water, and consequently the difficulty of obtaining it, is generally estimated too low.

Mr. Krügers' experiments show that potatoes and oats are the crops which benefit most from irrigation, and an annual depth of 120 mm. (4.7 inches) suffices amply for them; winter rye only needs half this amount, but savoy cabbages require twice as much.

Taking the average quantity of water at 100 mm. (4 in.) the complete irrigation of 100 ha. would need 100 000 cub. m. (per 100 acres 1 452 000 cub. ft.).

The plants need daily, to resist the effects of drought, at least 2 mm. which is the equivalent of 2 000 cub. m. per day for 100 ha. (290 400 cu. ft. per 100 ac.).

Allowing for 15 hours of work daily, this amount of irrigation would require 37 l. (1.3 cu. ft.) of water per second.

In years of extreme dryness, like that of 1911, an increased supply would have been very beneficial, but the amount mentioned gave satisfactory increase in the yield and is sufficient for average seasons.

So large an amount of water is best obtained from a river or neighbouring brook. In Germany 1 l. per sq. km. (0.57 gallon per sq. mile) or even less, runs off in times of great drought, the streams must have a basin of 40 to 50 sq. km. to irrigate 100 ha. (6 to 8 sq. miles for 100 acres) during the season of low water. Experience however shows that streams of these dimensions are often dry.

It is therefore necessary to determine in each particular case if the stream has a sufficient continuous supply of water. Lake water can also be had recourse to. If the lake is fed by springs or streams and has an outlet, the volume of the effluent will of course be somewhat diminished. It should be noted that increased demands upon the lake only cause the springs to flow the more strougly.

Recourse can also be had to wells and springs, provided their output is ascertained.

3. *Installation of System of Irrigation.*

Irrigation by spraying, which necessitates the use of water under high pressure, needs the employment of a pump driven by machine-power, pipes for carrying the water to the field, and sprinkling machines to turn the water into spray. The best pump for the purpose is a high-pressure centrifugal one; the ordinary pump does not supply sufficient pressure.

To supply the motor force, only a steam engine, or other powerful machine can be used. Such steam-engines which are so much used on large estates and for which there is no other employment at the time of irrigation can be thus turned to good account.

For each hectare of surface to be irrigated 0.4 to 0.5 H.P. (per acre 0.16 to 0.2 H.P.) is necessary; this alone excludes the use of wind motors without the consideration of their irregular action.

For the main pipes only iron can be used, for no other substance will stand the high pressure. Nevertheless, flexible hose of vulcanized hemp are not to be despised.

These serve, not only to connect the sprinkling machines with one another and with the source of delivery, but also permit of a change of direction in the latter. But as little as possible of this hose should be used, as it does not last well.

The main-pipes must have a diameter sufficient to prevent the average speed of the water from exceeding or remaining below 1 m. (3.28 ft.) per second. This speed must however often be exceeded in the case of the sprinkling carts by reason of their construction.

4. *The Amount of Each Irrigation.*

Part of the water used wets the aerial portions of the plants and is lost through evaporation. Another part is lost from the evaporation of the water which has fallen on the ground, and the rest filters into the soil and reaches the roots.

Therefore, the loss by evaporation remains fairly constant independently of the amount of water used each time.

Since the amount of water used is proportional to the volume of each watering, the latter should be increased as much as possible, which has the further advantage that the sprinkling carts have not to be moved so often. Care should however be taken so as not to cause new losses by infiltration.

The writer found that on light sandy soil 30 mm. (1.18 inch.) of water could be used each time without fear of loss due to infiltration. Three or four waterings would than suffice for the year.

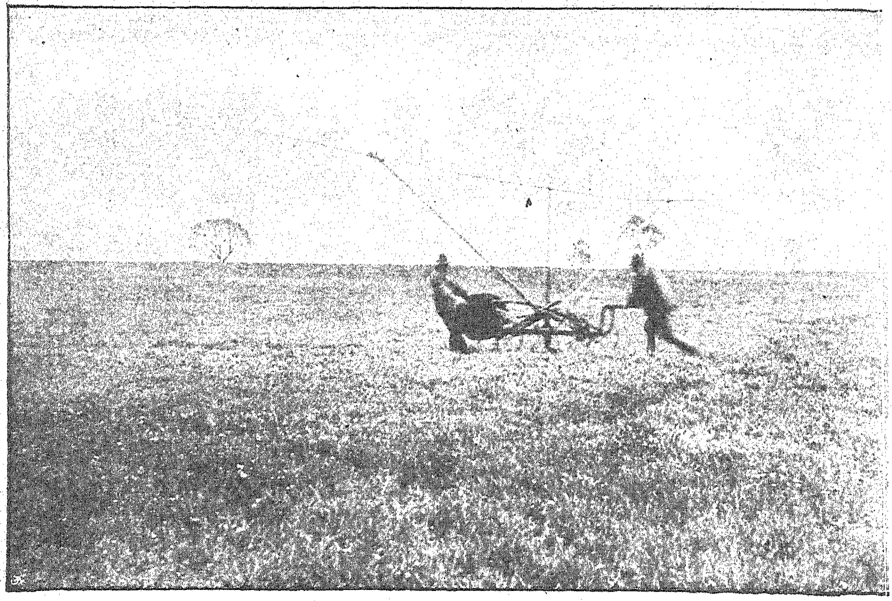

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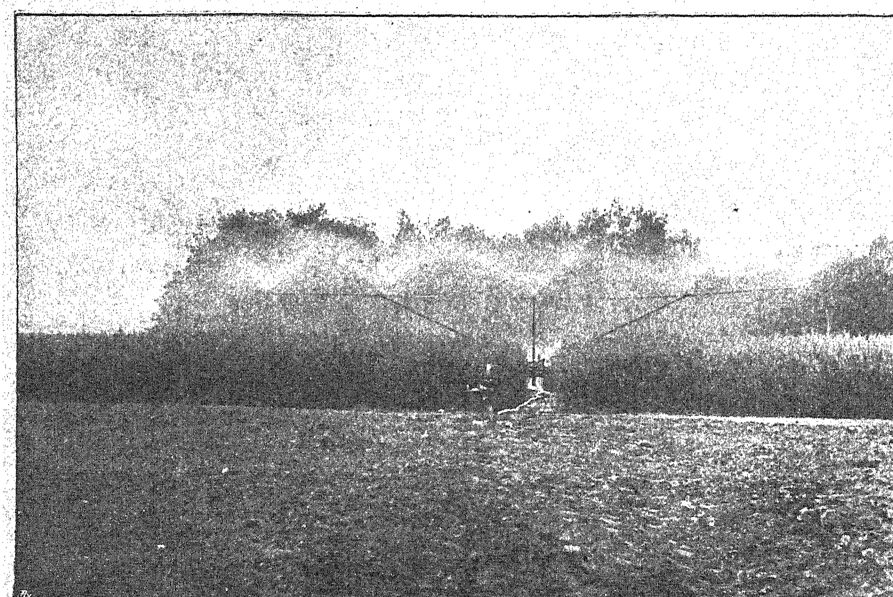
Fig. 1. — Rodatz watering machine.



Permission of the Deutsche Landw. Presse.

Fig. 2. — Rodatz watering machine working.

Permission of the Deutsche Landw. Presse

Fig. 3. — Szczepkowski watering machine working.

5. *Season for Watering.*

Cereals need most water at the time of tillering.

The best time for irrigation in the case of potatoes, has not yet been very exactly determined. The experiments of preceding years seem to indicate the months of July and August as the most favourable, though in 1911 the highest yield was afforded by potatoes irrigated from June to August.

It is often asserted that watering must only be done in overcast weather, but the writer has shown that even with the most brilliant sunshine irrigation gives excellent results.

The temperature of the water used is of no importance, it appears. This is explained by the fact that a small amount of water, say 30 mm. (1.18 in.) is not sufficient to lower appreciably the temperature of the large volume of soil which it penetrates.

Even in the Western States of North America, where the heat is so great, watering is done without hesitation in full sunshine, and even with large quantities of water.

Gerlach found by careful experiment that the temperature of the water used in irrigation has no influence upon the yield.

The time of each irrigation, is determined by the degree of humidity of the soil which is ascertained by boring.

6. *Types of Soils Requiring Irrigation.*

Sandy, or loamy soils with a fair amount of humus best repay irrigation.

On heavy soils the effects were less marked and less beneficial, but the small number of experiments with these soils does not permit of definite pronouncements; in any case their tendency to cake as a result of watering is a disadvantage.

It should be noticed, in passing, that irrigation without a generous supply of manure cannot yield satisfactory results, since the water does not in itself contain sufficient nutritive substances. In order to obtain good harvests as a result of irrigation, abundant supplies of fertilizers must be given which are completely utilized.

7. *Results.*

The results are given in delail in the " Mitteilungen des Kaiser Wilhelms Institut, Band I, Heft 4, II2 and III3. The following table gives the most important results.

Year	Rainfall April-July	Crop	Yield per acre			Increase per acre		Increase per 100 cub. ft. of water	Cost per acre			Net gain per acre
			Unwatered	Watered					Watering	Manuring	Total	—
	—			with								
	in.		cwt.	in.	cwt.	cwt.	£ s d	d	£ s d	£ s d	£ s d	£ s d
1907 . . .	11.7	Oats	13	4.5	19	6	3. 9. 9	5	—	—	—	—
1908 . . .	9.3	Oats	10	5.5	19	9	5. 9.10	6 3/4	—	—	—	—
1909 . . .	6.4	Oats	12	5.5	25	13	5.19 .9	7	1.18.10	—.11.11	2.10. 9	3. 9. 0
1909 . . .	6.4	Potatoes	137	4.3	259	122	7.11. 0	11 ½	1.10. 6	1. 5. 9	2.16. 3	4.15. 9
—	—	(Starch)	22	—	48	26	—	—	—	—	—	—
1910 . . .	11.6	Winter Rye	16	3.1	19	3	1.15. 8	3 3/4	—	—	—	—
1910 . . .	11.6	Spring Rye	10	2.8	13	3	1.10. 1	3 ½	—	—	—	—
1911 . . .	4.1	Potatoes	62	11.0	210	148	18. 6. 8	13 ½	3.17. 8	1. 5. 9	5. 3. 5	13. 3. 3
—	—	(Starch)	11	—	44	33	—	—	—	—	—	—

In thi table the current market prices are given. Although the increase in straw is not given, its value has been reckoned in the gain.

The cost of irrigation has been valued at 7 pf, per cub. m. (2 ⅓ *d* per 100 cub. ft.) estimated on actual cost of working and including the interest, liquidation and up-keep.

The cost of fertilizers has been estimated by the difference between the cost of the fertilizers employed for irrigated plots and that of those used for non-irrigated, calculated according to Wolff's tables.

Naturally on a large scale, it is impossible to obtain the same increase of yield as in trial fields; nevertheless, under practical conditions irrigation can be employed with much profit.

For the practical agriculturist, it is of interest to have details of irrigation works which are at present in working order, therefore Hr. Krüger describes two in the Province of Posen. *viz.*

(1) Those of the estate of Ulrikenhof near Jaratschewo, the property of Hr. Rodatz, who farms state land.

(2) Those on the property of Hr. von Szczepkowski, at Leng near Schrimm.

II. The Estate of Ulrikenhof.

The irrigated surface amounts to 20 ha. (50 acres).

The water is obtained fom a ditch in the meadow, whose water usually flows into the Obra, but is dammed back at the period of irrigation. A high-pressure centrifugal pump worked by the steam-engine of the estate sends the water into the main pipes under a pressure of from 3-5 atmospheres. Irrigation is carried on from 5 a.m to 8 p.m with one hour's interval at midday, and at 17 litres (3 3/4 gallons) per second. The ground, which is 12 m. (39 ft.), above the water of the ditch, is sandy to loamy with numerous patches of gravel. The main pipe, 1450 m. (4770 ft.) long consists of cast-iron pipes, of which 800 m. (2620 ft.) have an internal diameter of 125 mm. (5 in.), and 650 m. (2140 ft.) a diameter of 100 mm. (4 in.). The smaller pipes terminate the main system which is fixed and sunk in the ground.

Every 25 m. (82 ft.) the main system has cocks to which the watering apparatus can be connected by means of hemp hose 42 mm. (1 ½ in.) in diameter.

The watering-apparatus of the Hartmann system, which was

used in 1910, was not very satisfactory, so that the inventor has improved it (1).

In 1911, six machines of the Rodatz system were also employed. The Rodatz apparatus (figs. 1 and 2), which is all of iron, consists of: 1) a frame with four very wide wheels, the tyre being 50 cm. (20 in.) wide, provided with two handles which allow of one man shifting it.

2) A pressure pipe fixed on the frame and surmounted by three other pipes directed upwards and forming a double-triangle with a long horizontal pipe of 12.5 m. (41 ft.). The latter carries three roses which send out a fine spray over a surface $10 \times 25 = 250$ sq. m. (300 sq. yds.) round the machine.

These machines, constructed by the Borck agricultural machine works cost 480 marks (£23.10*s*) each.

Experiments made hitherto have shown that cereals must be watered in spring from May 20th to July 10th, that is to say, about 50 days. Potatoes and turnips must be irrigated from June till September and serradella from June 1st to Sept 1st, winter rye needs watering only in May.

For the watering on the Ulrikenhof estate, only two men and a mechanic are required; even these are not occupied the whole time, and Hr. Rodatz reckons that they could well look after 8 machines.

In 14 hours 990 cub. m. (35 000 cub. ft.) of water are sprayed; this amount for 50 days is sufficient for 41 ha. (101 acres).

The cost for labourers wages, including the mechanic would be 3.7 marks per ha. (1*s* 6*d* per acre), a very small expenditure.

In 1911, there were watered: winter-rye, oats, serradella, sugar beets, and mixed fodder (followed by Savoy cabbage).

Watering began in the second half of May. The oats had already received up to 120 mm. (47 in.) of water at the beginning of July. Some control plots were left without watering, Atmospheric precipitations were very slight and amounted to

In April	26 mm.	10.2 in.
» May	14 »	5.5 »
» June	27 »	10.6 »
» July	16 »	6.3 »

(1) The new Hartmann system is described in a brochure published by the firm Oppen und Prinzke at Spandau.

in all 83 mm. (32.6 in.). Two late frosts (—2°C.) occurred on May 24th and June 11th.

The irrigation produced very marked effects, especially in the case of the oats and serradella as is shown by the following results :

1. *Ligowo Oats.*

Plots 1-12 were very light sandy soil, plot 13 loam. Manure per ha: 75 kg. (67 lbs. per acre) K_2O in the form of kainit; 45 kg. (40 lbs.) P_2O_5 as basic slag ; 45 kg. (40 lbs.) nitrogen as nitrate of soda. 100 kg. of oats per ha (89 lbs. per acre) were sown in lines 20 cm. (8 inches) apart on April 25 and 26, therefore very late.

The yield was as follows:

Plots No.	Watered with inches	Yield per acre in cwt.		Weight of	
		Grain	Straw	bushel lbs.	1 000 grains gm.
5	—	5.9	4.0	41 3/4	43.5
1-3 and 7-12	5.5	13.8	19.4	42 ½	46.5
13	5.5	25.0	35.5	44 ¼	49.1

Plot 13 having better soil than the others the yield is not included with the others.

The watering cost 83 marks per ha. (£1.12*s* 11*d* per acre). The net gain was 132 marks per ha. (£2.12*s* 4*d* per acre) and represented an interest of 27.5 %.

2. *Serradella,* 5 ha. (12 ½ acres).

This crop gave a net gain of 248 marks per ha. (£4.18*s* 4*d* per acre), a very high figure because the control plot was entirely burnt up by the drought.

3. *Winter Rye,* 1.1 ha. (2 3/4 acres).

The watered plots yielded 28.8 qls. per ha. (23 cwt. per acre).
non » » » 17 » » (13 ½ » »).

The increase of 11.8 qls. (9 ½ cwt.) gave a net gain of 168 marks per ha. (£3.6*s* 7*d* per acre).

4. *Sugar Beets*, 4.7 ha. (12.6 acres).

Manure (without dung) 6 qls. (4 cwt. per ac.) kainit, 2 qls. (1.6 cwt.) basic slag, 4 qls. (3.2 cwt.) bone meal, 4.8 qls. (3.8 cwt.) nitrate of soda. Amount of water 260 mm. (10 inches). Watering produced an increase of 97 qls. per ha. (77 ½ cwt. per acre). The respective sugar content was as follows

	Sugar %	Dry Matter %
Watered (large)	12,1	13,5
Watered (average)	14,6	13,7
Non-watered	17,4	17,4

Thus watering did not appreciably increase the sugar content.

To sum up, Herr Rodntz calculates that watering to the amount of 100 mm. (4 in.) per year, sufficient for the average crops, would cost 75 marks par ha. (£1.9*s* 9*d* per acre).

III. The Leng Estate.

After numerous previous experiments, watering was undertaken on a large scale in 1911. The Nolting system, entirely reconstructed and perfected by Herr von Szczepkowski, was used.

The water was taken from different parts of the estate and, as the supply was limited, the apparatus was made transportable as were also the main pipes.

The pressure pipe attached to the centrifugal pump which is driven by the steam-engine of the estate, and is laid to reach by the shortest route the edge of the field which is to be irrigated, and then along its centre. The pressure pipe consists partly of a hempen hose 100 mm. (4 in.) in diameter, partly of cast-iron pipes 100 mm. (4 in.) in diameter and 6 metres (20 ft.) long. The watering machine (fig, 3) is made up of an iron pipe 6 metres (20 ft.) long mounted on 2 wheels, which carry at either extremity a rose which can throw spray 3 metres (10 ft.) on all sides. The machines are joined by 6 metres (20 ft.) pieces of hose, 10 being placed in a row, thus covering a width of 120 m. (400 ft.).

This apparatus in constructed at J. Moegelin's machine factory in Posen. When it has watered one strip of ground it is pushed 4-5 m. (13-16 ft.) forward to water the next piece. As the main pipe is provided with cocks 120 m. (400 ft.) apart, to which is attached the hemp hose, it is possible to water without interruption a strip of soil 120 m. (400 ft.) wide; and the same in length.

In order to irrigate the next 120 m. (400 ft.), in length, the hemp hose is attached to the second cock. When this length of of ground has been watered the whole apparatus is turned round 180° and works in the opposite direction, in the order of the coks... III, II, I. When this operation in completed the movable water-system is moved to a distance of 240 m. (800 ft.) parallel to its first position, and watering is resumed according to the same method. It will thus be seen that the apparatus can irrigate two large strips of ground from both parts of the main-pipe without altering the position of the latter.

The system employed at Leng possesses the advantage that by it a field of 1.44 ha. (3 ½ acres) can be irrigated without interruption. It has only one drawback, that the cereals which have already attained some height are injured by the passage of the workers and the wheels.

Herr von Szczepkowski estimates the cost of installation at 4485 marks (£220), which to the writer appears rather low. In addition to the mechanic its working requires two other men.

Atmospheric precipitation at Leng was in 1911 very low, namely:

In April	6 mm.	0.24 in.
» May	7 »	0.28 »
» June	11 »	0.44 »

Oats, serradella and lupins were watered. In spite of the unusual drought, and the excessive lightness of the sandy soil irrigated, and although only one irrigation of 20 mm. (0.8 in.) was given, the operation was completely successful. Herr von Szczepkowski estimates the increased yield of the oat crop due to this scanty irrigation of 20 mm. at 5.4 qls. per ha. (4.3 cwt. per ac.) with a value, counting the straw, of 108 marks per ha. (£2.2*s* 10*d* per acre). The watering only costs 14 marks per ha. (5*s* 7*d* per acre), leaving a net gain of 94 marks per ha. (£1.17*s* 3*d* per acre) as the result of a single watering.

IV. Conclusion.

When an underground fixed main system is used, more capital must be expended on the pipes. But on the other hand, the constant shifting of a movable system requires more labour. Which of the two methods is preferable? It may be said that the movable system is more suitable where, as at Leng, several sources of water can be used for the irrigation of a limited space, and also when a

small amount of water used over a large space is more advantageous than the copious watering of a limited area.

The experiments hitherto made do not permit of more definite conclusions. The decision as to whether the Ulrikenhof or the Leng system is the better can only be decided by experiment.

In additlon to the irrigation works already described, those of Eduardsfelde near Posen (200 ha. = 500 acres) and of Wüstendorf and Steine near Breslau (600 ha. = 1500 acres) may be mentioned. n both, sewage water from the town and not pure water was used.

487 ETCHEVERRY, B. A. **Pumping for Irrigation in British Columbia.** — *Report of Proceedings of the Fifth Annual Convention of the Western Canada Irrigation Association*, pp. 108-116. Ottawa: Government Printing Bureau, 1911.

Canada: British Columbia

The irrigation of cultivated lands has grown to be of very great importance in British Columbia. The quantities of water given vary with the crops, and in this connection the following figures may be reproduced :

Crops	Depths of water
Young Orchards....................	12 in.
Orchards in full bearing............	18 in.
Alfalfa and other forage crops	24 to 36 in.

For a depth of water of 2 feet over an area of 1 acre there is required an output of 1 cubic foot per second for 24 hours. These last figures are taken as the basis for finding out what pump should be used.

For an orchard of about 40 acres receiving a depth of water of 2 feet, during the 120 days of the irrigation period there is required, in order to obtain the necessary 80 acre feet of water, a pump giving a supply of 1/3 cubic foot per second and operating continuously.

The installation of a pump which operates throughout the irrigation season presents three main drawbacks:

1. A plant of this kind requires that the irrigation should be continuous or else that a regulating reservoir should be constructed.

2. A small plant is more expensive in proportion than a large plant·

3. It is more difficult to irrigate with a small than with a large supply.

Hence it is preferable to use large supply pumps operating during only one half or one third of the irrigation season.

The type of pump to be used depends on the supply required and the height of lift.

For very deep wells air pumps are used.

For lifting small quantities of water to small heights, hydraulic rams are employed, but this demands that a fall of at least 2 ½ feet should be available.

For lifting lake and river water, centrifugal pumps and piston pumps are chiefly used.

Single centrifugal pumps are capable of supplies of 200 gallons per minute to heights not exceeding 75 feet.

Compound centrifugal pumps may be used for heights exceeding 200 feet.

Piston pumps are best adapted for lifts of about 100 feet.

The efficiency of a single pump is about 50 % ; that of a piston pump 90 %.

Centrifugal pumps and piston pumps are most in use. They are driven by electro-motors, gasoline motors, or steam engines.

When electric power is available at a reasonable price preference should be given to the electromotor rather than the gasoline motor, the annual expenses of every description being at their lowest with the electric motor.

For the same reason and under the same conditions the gasoline motor should be preferred to the steam engine.

The steam engine should be used for large plants and where cheap coal is obtainable. It may be employed to advantage for the production of electric energy which is afterwards distributed to the various pumping plants.

The complete installation of a centrifugal pump driven by a steam or gasoline engine should not cost more than 100 dollars (1) per HP for a 10 HP engine, 75 dollars per HP for a 20 HP engine, and 60 dollars per HP for a 50 HP engine.

With an electric motor the installation may be carried out for two-thirds of the above costs.

The annual expenses of a pumping plant comprise the expenditure of energy, upkeep and repair and the fixed charges (interest and depreciation).

To lift one acre foot with a machine of 50 % efficiency there

(1) The Canadian dollar = 49.4*d* ; $ 100 = £20.11*s* 7*d*.

are required 2 kilowatt-hours, or ⅓ gallon of engine distillate, or 13 lbs. of coal.

Taking these figures as the basis and assuming prices to be as follows:

electricity: 3 cents per kilowatt-hour;
gasoline: 22 cents per gallon;
coal: 6 dollars per ton;

the cost of the energy expended is:

6 cents for an electric motor;
7 ⅓ cents for a gasoline motor;
4 cents for a steam engine.

The costs of upkeep do not exceed 5 cents per hour for an electric motor, 10 cents for a gasoline motor and 40 cents for a steam engine.

The repair costs do not exceed 1 % of the total cost of the plant for electric motors and 1 to 1 ½ % for gasoline and steam.

The fixed charges amount to 16 % of the capital invested for electric motors, and 18 % for gasoline and steam engines.

Combining all these data, a good estimate may be formed of the cost of installation and the annual expenses of pumping plant.

It is desired, for instance, to lift the water required for irrigating an area of 40 acres to a height of 100 feet. 6 inches depth of water are given per month, the irrigation season lasts 4 months and the pump only operates ⅓ of that time.

Under these circumstances a 40 HP plant is required, costing not more than 2 000 dollars, or 50 dollars per acre.

The annual costs of pumping per acre are given in the following table:

Motors	Fuel or energy	Upkeep	Repairs	Fixed charges	Total
Electric .	$ 12	$ 1.2	50 cents	$ 8	$ 21.7
Gasoline .	$ 14.66	$ 2.4	75 »	$ 9	$ 26.8
Steam ...	—	—	—	—	$ 27.35

From these figures it will be seen that the cost of lifting one acre foot to a height of 1 foot is 12 cents.

This cost is not excessive; it is justified by the fact that at the present time ordinary irrigations, where water circulation takes place by gravity alone, require the creation of dams and the laying down of very expensive channels and pipes.

Thus the Trenton scheme in the East of Washington, carried out by the United States Reclamation Service, costs 93 dollars per acre; the Umatilla scheme in the East of Oregon 60 dollars per acre.

On the other hand, pumping plants erected in different regions have yielded excellent results. At the present time in the East of Washington State water is pumped from a depth of 250 feet. In the citrus districts of California it is quite a usual thing to pump from 200 feet depth, and plants pumping from as much as 460 feet depth are regarded as remunerative.

The cost of pumped water in the district of Pomona (South California) is 15 dollars per acre for one acre foot.

The United States Department of Agriculture has carried out enquiries showing that the cost of pumping by private plants of 10 to 100 HP with lifts between 100 and 300 feet ranges from 10 to 90 dollars per acre foot.

Pumping plant pays above all in apple orchards, the net profits of which may be 200 to 600 dollars per acre.

VEAUVY. **Salt Encroachment. New Methods for Freeing Lands from Salt.** (L'envahissement salin. Nouvelles méthodes de dessalements des terres). — *Le progrès agricole et viticole.* 28e Année, No. 53, pp. 795-799. Montpellier, 31 Décembre 1911. **488**

For all cultivations on a large scale, irrigation should supplement rain-water and not be regarded as the sole source of moisture. In the low-lying clayey plains under the North African climate, excessive and ill-planned irrigation generally results in inevitable salt deposits, which are an ever-growing menace to North African agriculture. The Author relates, by way of exemple, what took place in the irrigated plains of Oran. **Algeria**

1. *Condition of things before the introduction of irrigation.*

The partly irrigated plains of the Sig, the Habra, the Mina and the Cheliff are formed by alluvial soils carried by the rivers which traverse them. They were formerly periodically inundated by the heavy winter floods of the rivers, but these inundations were as a rule transitory, so that they hardly had any influence on the subsoil water table, the water passing over too rapidly to make its way to any depth into the land.

2. *Condition of things after the installation of irrigation.*

a) At the present time the waters of the big floods, which carry much salt and are consequently most fertilising and contain the least salt, generally run to the sea without covering the plains. The canals with their insufficient fall are incapable of affording an outlet to these waters, and the silting of the canals would be too considerable and consequently the process too expensive.

b) The waters most heavily charged with salt, which are the clearest and therefore the least fertilising, are spread over the surface of the land in the heart of the summer.

c) Rain water added to excessive irrigation has had a considerable influence on the subsoil water tables, the levels of which have sometimes been raised 5 or 6 metres (16 ft. 3 in. to 19 ft. 6 in.). The water table at times becomes flush with the surface of the soil.

d) One of the most powerful causes of the rise in the water table is due to the formation of marshes in the basins traversed by the irrigation channels within embankments. These channels thus form real obstacles to the outflow of the surplus waters, which are always extremely saline from contact with the soil on which they have circulated. The surplus water therefore stagnates in the depressions and slowly disappears by evaporation or infiltration. This drawback should be met by the construction of a drainage canal parallel to each irrigation canal.

Consequences: The salt invades the whole of the irrigated lands. The entire evil consequently results from the considerable quantities of water the land is made to absorb (causing a rise in the level of the salt water table) and from the excessive evaporation taking place at the surface of the ground and producing saline deposits.

Remedies. Movements of salt in the soil.— The salt makes two opposite and alternating movements in the soil: 1, rising during the dry summer period; 2, sinking during the wet winter period. The principal factors governing these opposite movements are: 1, the larger or smaller quantities of rain water and irrigation water; 2, the permeability of the soils and subsoils; 3, capillarity; 4, the increased evaporation due to the heating of the soil. If one of these factors were got rid of, however, the movement would be suspended. Therefore saline encroachments may be dealt with by different means, the selection of which must vary with the particular circumstances.

Getting rid of salt from non-irrigated regions with deep water table. — To enable this method to yield successful results, the salt water table must be maintained at a depth of 1.50 metres (4 ft. 10 in.) during the winter time. The system consists in allowing the sinking movement to take place and in preventing the rise. When the heavy rains come on, the salt is carried away by the water and descends with the latter. At the end of the heavy rains a superficial ploughing of 6 to 8 cm. (2.4 to 3.2 inches) depth should be carried out, followed by one or two thorough harrowings in order to loosen the surface; evaporation is thus stopped. After each successive rainfall another superficial ploughing must be done. This of course should

be repeated whenever a crust, even a thin one, might form, until the next heavy rains.

By the time these latter come on the salt has been able to rise only very slightly. The heavy rains once more carry down the salt deeper. From that moment, in the majority of cases, the surface layer of the soil is clear of salt, and cultivation is made possible. In these lands, for all cultivations, the method of drilling in lines some distance apart should be adopted, which allows of thorough hoeing and earthing up during the growth of the crops.

After the crop, fresh surface tilling should at once be carried out, in order to prevent evaporation until the return of the heavy rains.

Getting rid of salt from irrigated lands. — On irrigated land the same methods of preparing the soil, of sowing in lines and of after-tillage should be adopted. The insufficiency of rain may be made up for by the possibility of irrigating throughout the winter. Summer irrigations may be made less frequent and plentiful in consequence of the salt having been got rid of. After the crop the soil must be immediately loosened along the whole of the surface to prevent evaporation until the heavy rains. From this it will be seen that in addition to its other advantages, the method allows of irrigating areas twice as large as at present with the same volume of water.

TILLAGE AND METHODS OF CULTIVATION.

CASCÓN, JOSÉ. **Ploughing in Spain.** (Labores). — *Boletin de Agricultura tecnica y económica,* Año III, No. 36, pp. 1120-1124. Madrid, 30 Diciembre 1911. **489**

Spain

To make a good furrow, it is necessary to know the proportion which ought to exist between the width and depth. The width ought to be 1.3 to 1.5 of the depth. This is the extreme limit; the higher figure is used in the case of light soils, the lower when the soil is heavy.

The following is the method used with a fixed mould-board plough:

The area to be ploughed is divided into a certain number of portions, which are worked successively.

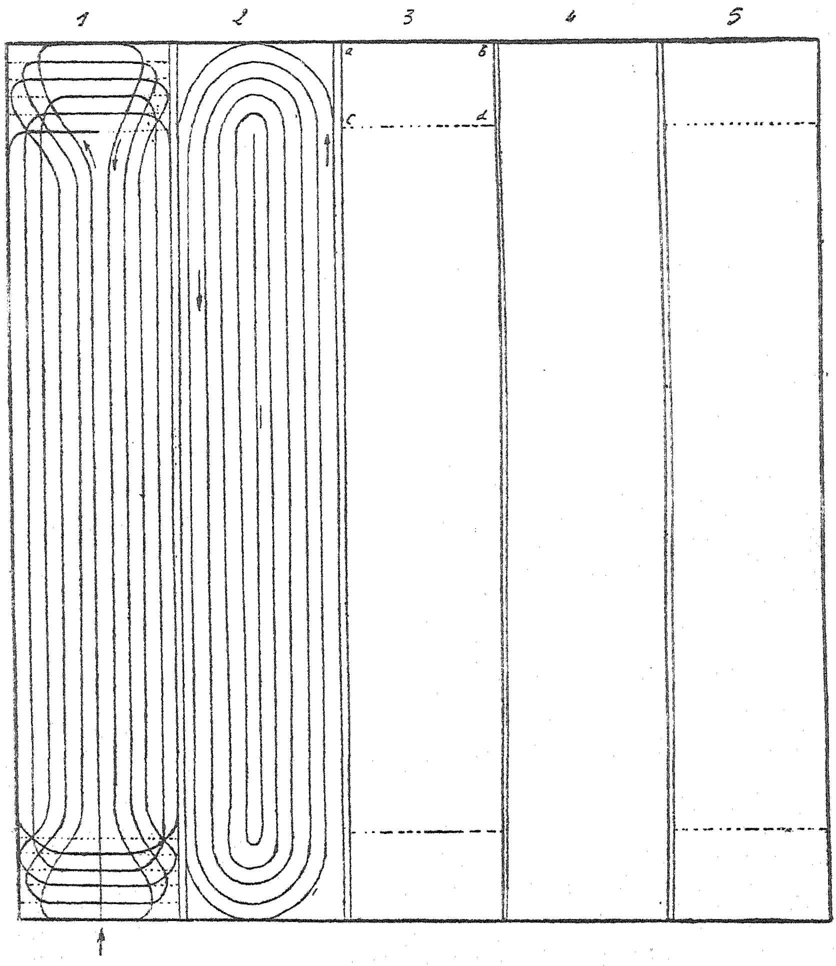
Work begins on the edges of the divisions, the furrow is carried round the extremities, and ends in the centre, as is shown on division 2 of the accompanying diagram. This method leaves in the centre a part which is badly ploughed; this causes the water to be very unequally distributed, and as a result, the crops are wanting in uniformity.

In order to avoid this, lan·ls are set ont 20-30 metres (65.6 ft.-98.4 ft.) wide and 7 to 9 times as long. Then the furrow is begun in the middle of land 1 and ended on the edges (see figure). No. 2 is left out, and no. 3 worked as before. No. 4 is passed over, and no. 5 ploughed. This method is followed to the end of the field.

Then the lands which were omitted are ploughed, beginning this time at the edge and ending at the centre. The figure shows, following the direction indicated by the arrows, that on the edges of two consecutive divisions, the earth is thrown up on the same side, therefore no "last ridges" are formed. These only occur in the middle of the lands represented by even numbers. It is to be noted that the extremities *a*, *b*, *c*, *d* of the plots are worked from *a* to *c*, that is to say, from the extremities towards the centre. The area to be ploughed is divided into lands in order that the work may be regular, and to avoid excessive fatigue for the animals.

The amount of work done in one day by a pair of horses or mules, naturally varies according to the time of year, but the following table gives an average for heavy land:

Implement	Area Worked Ares	Area Worked Acres
Simple mould-board plough	40-50	1 to 1 ¼
Double plough (doing two furrows at once	60-70	1 ½ to 1 ¾
Triple and quadruple plough	130-140	3 ¼ to 3 ½
Harrows	350-400	8 ¾ to 10
Diggers	115-120	2 ¾ to 3
Rollers.	200	5
Cultivators.	400	10
Manure distributors . . .	400	10



The arrows show the direction in which the plough travels. The work done on the lands bearing the odd numbers is called *alomando* and that on the others *hendiendo*.

The Lister Dry-Farming System for Maize Growing.

490 JOFFRIN, HENRI. Culture du Mais en terrain sec par le système Lister. — *Journal d'Agriculture pratique*, 76e Année, T. I, No. 3, pp. 82-86. Paris, 18 Janvier 1912.

MOLDO, MONTANARI. El sistema Lister, de cultivo de secano, para el maiz. — *Revista de la Asociación rural del Uruguay*, Año XL, No. 11; pp. 825-828. Montevideo, Noviembre de 1911.

France. Uruguay

Maize is a plant requiring a great deal of heat and water; consequently in dry regions operations of cultivation ensuring a sufficient supply of moisture to the roots must be adopted.

These cultivating methods may be divided into two groups: (a) those which prepare the soil before sowing and which allow of water being absorbed, stored up and retained; (b) those relating to sowing and subsequent care.

The first group comprises one or two deep ploughings and two harrowings at six weeks interval. The harrowings follow the ploughings immediately and very often an appliance is used which carries out both processes simultaneously.

In the spring, at the time of sowing, the well stirred soil has stored up a good portion of the rain. The water is in the deeper part of the arable stratum, and in order that germination may take place the seed must be embedded until it is in contact with the moist layer, while still keeping it near enough to the atmosphere.

To solve this problem, furrows are ploughed in the soil down to the damp part, and at the bottom of these furrows the seed is put and covered with a little earth. Later on, instead of earthing up, the furrow is closed gradually but not completely, so as to leave a channel where the water falling during the growing period co lects.

For the application of the foregoing principle, two implements are used: the Lister drill and the Lister cultivator.

The drill (fig. 3) has in its fore part a ridger *a* which opens a furrow 12 to 14 in. deep; behind it is a small subsoil part *b* which loosens the bottom of the furrow; in this loosened earth the drill tube *c* inserts the seed, which is finally covered over by the disc *d*. The drill is generally double and works two furrows at once.

The opening *a* (fig. 1) of the furrow *s* at the surface of the soil is about 16 in. and the axes *y*, *y'* are 3 ft. to 3 ft. 3 in. apart. The earth thrown up by the ridger accumulates at *n*, *n'* between the furrows, above the level *x*, *x'* of the soil.

Two months after sowing, the soil is subjected to its first treatment with the Lister cultivator (figs. 4, 5 & 6). This appliance is a sledge fitted behind with pulverising discs. The sledge is made up of two parallel pieces of wood *a*, *a'*, separated from each other by the width of the furrow, on one of the edges of which each is supported. The chief object of this sledge is to regularise the mounds, *n*, *n'* (fig. 1) formed at the time of sowing and to allow the proper working of the discs *b*, *b'*. The latter, which number three for each part of the sledge, are assembled on a shaft, the angle of which α and α' (fig. 4) is variable and can be regulated according to the needs of the work. Behind the discs is a sheet iron guard *c*, intended to protect the maize as shown in fig. 5. The machine is fitted with a seat *s* (fig. 6) for the driver, and near it a lever *l* for raising the pulverisers and the iron guard.

The discs loosen the surface *n*, *n'* (fig. 2) of the soil, carrying out a thorough hoeing, and throwing the earth to the bottom of the furrow *a*.

The cultivator may either be put through one working only, or — and this is preferable — the inclination of the shafts of the discs may be so adjusted as to effect almost complete filling in two operations. This ensures a more thorough destruction of weeds and a better retention of moisture.

By applying the Lister method, Messrs. Campion, in the department of Caseros (Uruguay) in the 1910-1911 harvest, in spite of exceptional drought, obtained excellent results. They had sown 700 hectares (1 750 acres) with maize; the entire area had been tilled in exactly the same way, but 400 hectares were drilled on the ordinary system and 300 on the Lister system.

On the neighbouring farms, where the earth had only been superficially tilled, no crop whatever was produced. On the 400 hectares of ordinary sowings on a good tilth, there were obtained from 7 to 8 qls. per ha. (5.6 to 6.4 cwt.) per acre; on the 300 hectares treated on the Lister system the crop was 15 qls. (12 cwt.) for the round local maize and 25 qls. (20 cwt.) for a North American variety. These figures should be increased 7 to 8 %, owing to a loss due to a frost which occurred at the end of summer and which chiefly affected the later maturing American maize.

The crop obtained was not only excellent for the year, but even rivalled the good crops in the most favoured years.

The comparative cultivation accounts of the ordinary system and the Lister system for a normal year may be computed as follows; taking the price of a quintal of maize at 25 francs (10*s* per cwt.) it is easy to calculate the net surplus secured by means of the Lister system.

Soil already under the plough.

(a) Ordinary system.

		per ha.	per ac.	
One ploughing, two harrowings and sundry expenses	fr.	32.00	10*s*	3*d*
Drilling and cost of seed	»	20.00	6*s*	5*d*
Interculture; harvesting and sundry expenses	»	12.50	4*s*	0*d*
Total	fr.	64.50	20*s*	8*d*

Yield: 12 quintals of grain (9.6 cwt.).

(b) Lister system.

		per ha.	per ac.	
One ploughing, two harrowings and sundry expenses	fs.	32.00	10*s*	3*d*
Price of seed and sowing with the Lister furrow drill	»	60.00	19*s*	2*d*
Interculture: moulding up twice with the Lister cultivator	»	60.00	19*s*	2*d*
Total	fr.	152.00	48*s*	8*d*

Yield: 18 quintals of grain (14.4 cwt.).
Net gain: 62.50 frs. (20*s* per ac.).

Virgin soil.

(a) Ordinary system.

		per ha.	per ac.	
Two ploughings, two harrowings and sundry expenses	fr.	60.00	19*s*	2*d*
Drilling and cost of seed	»	20.00	6*s*	5*d*
Interculture; harvesting and sundry expenses	»	12.50	4*s*	0*d*
Total	fr.	92.50	29*s*	7*d*

Yield: 17 quintals of grain (13.8 cwt. per ac.).

(b) Lister system.

		per ha.	per ac.	
Two ploughings, two harrowings and sundry expenses	fr,	60,00	19*s*	2*d*
Cost of seed and drilling with Lister furrow drill	»	60.00	19*s*	2*d*
Interculture; moulding up twice with Lister cultivator	»	60.00	19*s*	2*d*
Total	fr,	180.00	57*s*	6*d*

Yield: 25 quintals of grain (20 cwt. per ac.).
Net gain: 112.50 fr. per hectare (36*s* per ac.).

For soils already under cultivation in a dry year the crop secured with the ordinary cultivation system is estimated at 5 qls. per ha. (4 cwt. per ac.) and that obtained with the Lister system at 12 qls. (9.6 cwt.); for virgin soils these crops are estimated at 9 and 16 qls. (7.2 and 12.8 cwt.) respectively.

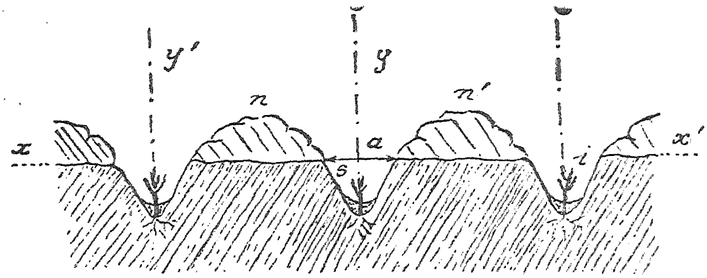


Fig. 1. — Transverse section through the furrows shortly after the germination of the maize.

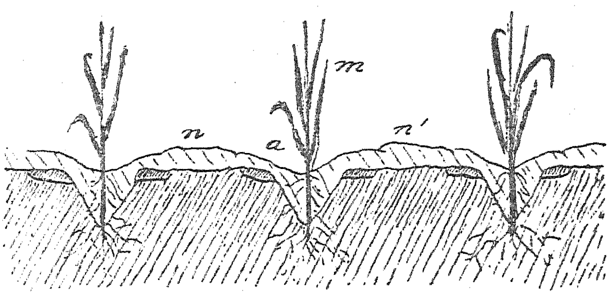


Fig. 2. — Transverse section through the furrows after filling in.

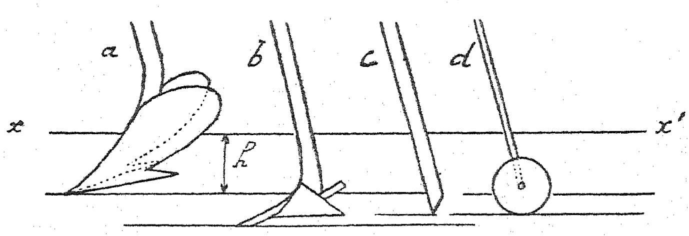


Fig. 3. — Lister drill.
a, ridger. — *b*, sub-soiler, — *c*, drill tube. — *d*, covering disc. — *xx* soil level. — *h*, depth of work.

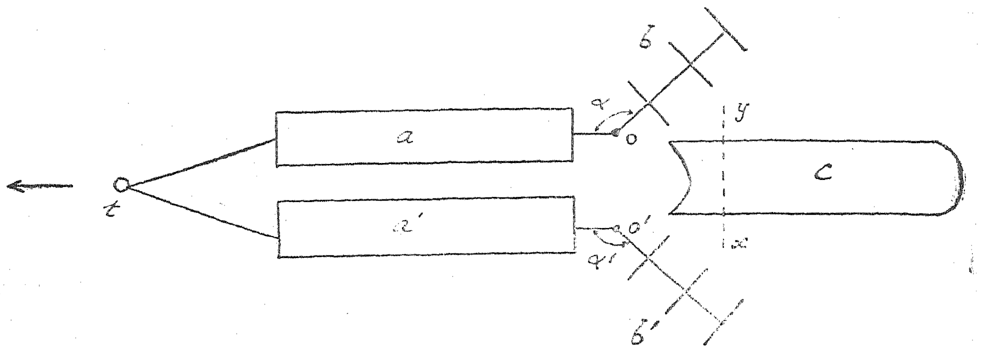


Fig. 4. — Lister cultivator: plan.
a', sledges. — *b b'*, disc pulverisers. — *c*, iron guard. — *t*, harness attachment.

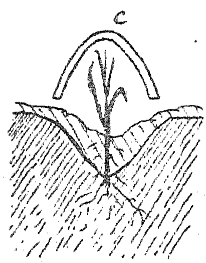


Fig. 5. *Section x y of Fig. 4*

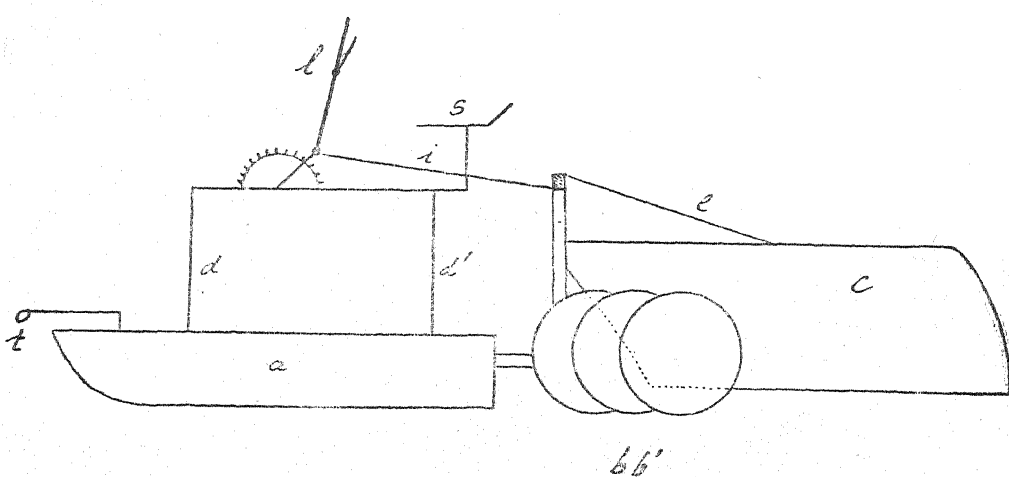


Fig. 6. — Lister cultivator: elevation.
a, sledge. — *d d'*, frame supporting the driver's seat *s*. — *l*, lever for raising the pulverisers *bb'* and the guard *c* by means of the rod *i* and chain *e*. — *t*, attachment.

MANURES AND MANURING.

Some Recent Experiments with Calcium Cyanamide or Nitrolim, and their Practical Bearing. 491

(Figures in brackets refer to the bibliography at the end of the article).

After the systematic experiments carried out on a large scale by Müntz and Nottin (*C. R. Ac. des Sc.* CXLVII, 9026), which established to a certain extent the practical conditions of using calcium cyanamide in agriculture, many others have been made during the last four years in different countries and for different crops.

It will be useful therefore to give a summary of the results obtained as they have been drawn up by Professors A. Grégoire and J. Hendrick of Gembloux (1), in order to deduce general rules for the application of this manure.

The question of calcium cyanamide may be viewed under three aspects:

a) The industrial problem of production from existing sources, its present conditions and development; for this problem there are only contradictory data, because they are indirect and interested.

b) The scientific problem of the phenomena of the transformation of calcium cyanamide in the soil, as well by bacterial, as by chemical action. These actions probably take place simultaneously, the one prevailing over the other, according to the different conditions of soil and culture.

c) The practical problem of the application in agriculture, and of the manurial value of calcium cyanamide.

The solution of the first two problems is still premature; because for the first, a direct and definite enquiry is necessary; and for the second, researches must be made on a wider basis. On the other hand, if no absolute result has been reached, much light has been thrown on the third problem, and the question may be brought up to date on the basis of Müntz and Nottin's work.

General Crops. — From recent literature, which is copious, on the fertilising effect of calcium cyanamide we may deduce a preliminary fact: *viz.* that calcium cyanamide, in 70 to 80 %, of the cases, has given results, if not equal, at least comparable with

the other chemical nitrogenous manures: nitrate of soda, nitrate of lime and sulphate of ammonia.

Let us now consider some of the most recent typical experiments, which, considering their trustworthiness, their duration, their extension, and the widely diverse districts and countries where they were carried out, may be considered of general importance.

Denmark

EXPERIMENTS IN DENMARK. — Experiments were made from 1904 to 1909 in six Danish Experimental stations (2).

The manures used for experiment were nitrate of soda, nitrate of lime, cyanamide, sulphate of ammonia and liquid manure.

Averaging the different crops, soils, and years, and putting at 100 the yield obtained from the use of nitrate of soda, the average results were as follows:

	Root crops	Cereals
Nitrate of lime	79	88
Sulphate of ammonia	71	96
Cyanamide	42	74
Liquid manure	65	72

The average for cyanamide, when it was drilled in, was 68.

The residual effects observed in 1910 showed nothing remarkable; they were however more evident for the cyanamide and the sulphate of ammonia. The experiments which were afterwards made, on a wider basis, in collaboration with the provincial agricultural societies, gave results which, as a whole, agreed satisfactorily with those adduced above.

England

EXPERIMENTS IN ENGLAND. In the experiments on mangolds at Rothamsted, calcium cyanamide gave similar results to those obtained with sulphate of ammonia, owing to the relative richness of the soil in lime; but in the case of barley the results were less satisfactory. We may here give the most important results gained from the experiments with nitrogenous top-dressings made in 1910 and the preceding years at the Experiment Station of the Royal Agricultural Society of England at Woburn (3). For 1910 they were as follows:

	Oats per ac. Bushels	Mangolds per ac. tons	cwt.
Nitrate of Soda	51.2	34	15
Nitrate of Lime	49.3	36	17
Sulphate of Ammonia	48.7	29	4
Cyanamide	52.1	35	15 ½

The quantity of nitrogen applied was in the proportion of 1 cwt. per acre of sulphate of ammonia. These results, like those of the preceding year, prove that at an equal price, or rather with equal quantities of nitrogen, the different nitrogenous manures including cyanamide, when applied to cereals as a top-dressing, have practically the same effect. The mangolds behaved in a similar manner, showing even a slight superiority under the cyanamide treatment, though this was less than with the nitrate of lime. As regards the residual effects of these manures on wheat, after the mangolds, they were practically not noticeable; indeed, nitrate of soda and sulphate of ammonia had rather a depressing effect, while cyanamide gave an increase of 1 ½ cwt. per ac. as compared with 2 ¼ cwt. with nitrate of lime.

These results however do not allow of any positive valuation of the residual effects of cyanamide.

Belgium

EXPERIMENTS IN BELGIUM. — Of great interest at the present moment are some experiments in pots recently carried out by Professors A. Grégoire and J. Hendrick at the Station for agricultural chemistry and physics at Gembloux (1). These experiments were made on timothy grown in ferruginous sand, and the following preparations were applied and compared with sulphate of ammonia and shoddy: cyanamide, leather ground and roasted, crude ammonia salts, the waste products from these, and the ferrocyanide contained therein.

Cyanamide showed less effect on the timothy than sulphate of ammonia and shoddy.

If we take the ratio:

$$\frac{\text{Increase of produce . . .}}{\text{Utilisation of the nitrogen}} = \frac{100}{100} = 1$$

for sulphate of ammonia, then the ratio for wool is $\frac{87}{73} = 1{,}19$, and for cyanamide $\frac{73}{75} = 0{,}97$. This weaker effect of the cyanamide appears to arise not from any decrease in the nitrogen supplied to the plant but from a slightly injurious effect of the manure.

France

EXPERIMENTS IN FRANCE. — The chief conclusions reached by the latest researches of Malpeaux have been already reported in this *Bulletin* (18); we shall now add some figures indicating the results obtained per acre in field experiments:

	Oats: net profit £ s d	Sugar-beets: sugar cwt.	Potatoes: net profit £ s d	Swedes: net profit £ s d	Poppies: net profit £ s d
Control	—	30 ½	—	—	—
Nitrate of soda	1 6 4	36	5 7 10	— 10 0	— 10 3
Nitrate of lime	1 9 6	38 ¼	4 19 9	1 3 1	— 4 4
Sulphate of ammonia	1 16 11	37 3/4	5 15 6	— 1 0	— 16 8
Cyanamide	2 2 0	40	4 12 5	— 8 8	1 5 8

These figures show that cyanamide and sulphate of ammonia gave the best results, nitrate of soda and nitrate of lime having probably been carried away by the heavy rains of the year (1910). The same year, Saillard (5) obtained like results with sugar beet. The following are his figures:

	lbs. per ac.	Yield per ac. tons cwt.	Sugar per ac. cwt.
Nitrate of soda	267	10 13	33 ½
Cynamide	267	10 10	33 ½
Nitrate of lime	308	11 2	35

Spain

EXPERIMENTS IN SPAIN. — Marti and Maylin have conducted a series of remarkable experiments in the irrigated soils of the experimental Farm School at Valentia (6). The following average results have been obtained from three different experiments:

	Onions cwt.	Wheat: Grain cwt.	Wheat: Straw cwt.	Rice cwt.
Nitrate of soda	352 ½	11 ½-13	21 3/4 -28 ½	—
Nitrate of lime	364	—	—	—
Sulphate of ammonia	375	10 ½-12 ½	20 3/4 -28 ¼	65 ½
Cyanamide	356 ½	10-12 ¼	20 ¼-27 3/4	64-66

The chief conclusions bearing on the case under consideration are:

1. Crops of slow growth, or of a long vegetative period, use cyanamide to the same, if not to a greater, extent than sulphate of ammonia.

2. On the other hand crops of rapid growth use cyanamide to a less extent than sulphate of ammonia, owing to the slower nitrification of the former.

Germany

SPECIAL CROPS. — The use of cyanamide, is of special interest with reference to the improvement and cultivation of marshy and

peaty soils and also with reference to certain special crops, such as woody plants and rice, a point hitherto little considered.

As regards the use of cyanamide in peaty soils, Professor Tacke's researches are of great importance. They were carried out at the Moor-Experiment Station of Bremen (7).

First come two series of comparative experiments in soil already cultivated, and in improved soil:

	lbs. of Nitrogen	Oats. Cultivated soil grain (cwts. per ac.)	Oats. Cultivated soil straw (cwts. per ac.)	Oats. Improved soil grain (cwts. per ac.)	Oats. Improved soil straw (cwts. per ac.)
No nitrogen	—	9 ½	14 3/4	3 3/4	5 ¼
Nitrate of soda	40	19	29 3/4	16	23 3/4
Nitrate of lime	40	—	—	18	26 ½
Sulphate of ammonia . .	40	16 ¼	27 ½	15 ½	22 ¼
Cyanamide	40	15 3/4	26	12	18 ¼
Lime-nitrogen	40	15	24	12 3/4	18 ½

The following are results obtained in a sandy heath soil:

		Oats cwts per acre grain	Oats cwts per acre straw
No nitrogen		8 ½	11
Nitrate of soda	20 lbs. nitrogen .	11	15 3/4
» » »	40 » » .	12 ¼	19 3/4
Cyanamide	20 » » .	11 ½	17
»	40 » » .	12	17 ¼

The cyanamide was applied 14 days before the sowing.

Sweden

H. v. Feilitzen confirms that in peaty soils with little nitrogen, cyanamide is less efficacious than nitrate of soda, and that as a rule cyanide nitrogen is of less effect than nitric nitrogen.

The experiments were carried out at the Experimental Station of the Swedish Moor Culture Society at Flahult (8). In these the action of cyanamide produced 30 % of the yield of grain obtained with nitrate of soda and 50 % of the yield of straw. The time of its application was immaterial.

Italy

For woody plants, as was to be expected, cyanamide has generally given satisfactory results. A series of experiments recently carried out in the most important viticultural zones of Piedmont (9), has proved the value of cyanamide for vines. In an experiment made on groups of 150 vine stocks, treated with 66 lbs. of manures

containing an equal amount of nitrogen, the following results were obtained :

	Grapes from 150 Stocks lbs.
Nitrate of soda	475
Cyanamide	543
Control	382

In the three lots the percentage of grape-sugar was 17.

Hawaii

It seems now well established that cyanamide is suitable for rice. Already at the Hawaii Agricultural Experiment Station the advantage of a nitrogenous manure for rice had been proved, and the relative superiority of sulphate of ammonia over nitrate of soda (10). At the same time the advantage of cyanamide was also proved, the excess over the controls being :

Sulphate of ammonia	37-67.7 %
Cyanamide	15.8-32.2 %
Nitrate of soda	6.4-19 %

Italy

These results have been confirmed by the experiments carried out in Spain, as above described ; and they are also confirmed by a series of experiments made on a large scale for the Experiment Station of rice culture at Vercelli (11). The results per acre were as follows :

Manure (besides mineral supers, 3 1/4 cwt.)	Gross return, less cost of manure £	s	d
Hoofs and horns, 210 lb.	10	13	7
Sulphate of ammonia, 145 lb.	10	17	6
Cyanamide, 186 lb.	10	10	9
Hoofs and horns, 89 lb. } Sulphate of ammonia, 74 lb. }	11	1	5

As the cyanamide and sulphate of ammonia are practically of equal value, the rice cultivator may use either according to his convenience.

Germany

USE IN PRACTICAL AGRICULTURE. — As a whole the practical results obtained by Müntz and Nottin have been confirmed. It appears certain that cyanamide does not injure germination, at least when a normal amount is applied.

If a larger amount be used, it would be wise to drill it in

before sowing, as the following results, obtained by Prof. Tacke, show:

Calcium cyanamide	Oats, cwts per ac. grain	straw
20 lbs. nitrogen, 14 days before sowing .	11.60	17.10
20 » » 8 » » .	11.43	15.87
40 » » with the seed .	9.94	13.61
40 » » 14 days before sowing .	11.96	17.28
40 » » 8 » » » .	11.34	16.03
40 » » with the seed .	10.09	14.52

England

Moreover, even as a top dressing, cyanamide appears to give good results, when used in normal quantities of from 1 to 2 cwt. per acre.

In the experiments made at Woburn the calcium cyanamide used as a top dressing slightly burnt the leaves of the oats, but the plants quickly recovered.

Italy

In any case there seem to be no drawbacks in connection with woody plants. Recent experiments conducted by the laboratory of agricultural chemistry at the Higher School of Agriculture in Milan appear to have demonstrated that cyanamide, if used with due precaution, has no harmful effect on the growth of the olive (12).

Further, from the latest experiments, the general rule may be deduced that cyanamide, to give a satisfactory result, requires soils with sufficient clay (16) (17), especially if they are poor in lime.

A recent result of two series of experiments carried out under very different conditions, points to the desirability of its being applied together with other nitrogenous manures.

Sweden

In fact, in the experiments made in Spain and described above, the best results were obtained with wheat as follows: cyanamide was applied in the autumn (9 lbs. of nitrogen), the wheat was then sown, and in the spring nitrate of soda (18 lbs. of nitrogen) was applied. Also at the Central Institute for Agricultural Experiments in Stockholm, where experiments were made in pots, the best results were obtained with oats, when a mixture of two parts of cyanamide and one part of nitrate of lime was mixed in before the seed was sown.

The yield in grain was more than half as much again as that obtained with nitrate of soda. Next in value to this came a mixture in which the cyanamide and nitrate of lime were equal. These facts merit investigation by further experiments.

Lastly one of the greatest practical difficulties is the fact that hitherto no product has ever been supplied of a constant uniform quality, and such as to give complete satisfaction as a good manure and easy to spread (14). Hence it is that this product is always under discussion, whereas calcium cyanamide of good quality would constitute a possible nitrogenous fertiliser, if wisely used and prepared in such a way as to prevent injury to the health and sight of the labourers when spreading it. For this purpose it is advised to mix with the cyanamide animal, vegetable, or mineral fats, in small proportions, sufficient to hold the powder (18).

Passing over provisionally the question of the industrial transformation of cyanamide into ammonia, we may say in conclusion that manufacturers should at present direct all their efforts to supplying a product which is uniform and easy to apply.

General Conclusions.

1. In principle, cyanamide may be compared with sulphate of ammonia as a manure, its value varying from 60 % of that of the latter to more than 100 %.

2. For certain crops the manurial value of cyanamide exceeds that of nitrate of soda, and is practically equal to that of sulphate of ammonia, as for instance for rice.

3. Cyanamide gives the best results in fairly good soils, particularly clay soils relatively poor in lime and nitrogen. It is unsatisfactory for poor sandy and marshy soils.

4. Although its caustic action on herbaceous plants is generally only temporary, it is desirable to drill in the cyanamide to a depth of from 2 to 4 in. two weeks before sowing, rather than to use it as a top-dressing.

5. The amount used should be from 22 to 45 lbs. of nitrogen, that is (at 20 %) 1 to 2 cwt. of cyanamide per acre.

6. It is probably very desirable to turn in a mixture of nitrate of lime and cyanamide in the autumn, or else to turn in the cyanamide in the autumn, and spread the nitrate as a top-dressing in spring.

7. The best time for application appears to be before or immediately after rain.

8. In applying it, all lumping should be avoided. It must be distributed with the greatest possible regularity, and intimately mixed with the soil.

9. The product supplied by the market must be as uniform as possible; and it is desirable that it should be treated with a small percentage of fatty substances.

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(18) See also this *Bulletin:* Nov. 1919, pp. 35-36; Dec. 1910, pp. 231-232; Jan. 1911, No. 72; Feb. 1911, No. 414; March 1911. No. 831; June 1911, Nos. 1694 and 1695; July 1911, No. 2093; Aug.-Sept.-Oct. 1911, No. 2518, and Feb. 1912, No. 308.

WILSON, JAMES (U. S. Secretary of Agriculture). **Fertiliser Resources.** — *Report of the Secretary of Agriculture, 1911,* pp. 162 (106-108). Washington, 1911. 492

United States

The United States Government having considered the question of fertilizers to be one of public importance, as being bound up with industrial and commercial interests, has taken part of the responsibility of supplying them into its own hands. The question

has two sides, both of which are being carefully considered by the Ministry of Agriculture:

1) To find fresh sources of fertilising substances, explaining the ways and means of preparing them for agricultural use.

2) To make known the value of chemical manures when wisely administered.

As an aid to the solution of the first problem, the last Session of Congress voted funds for the exploration and investigation of possible natural deposits of fertilising materials.

During the first six months thus employed the discovery was registered of certain areas at present productive, and of others secured for future use in the extraction of phosphatic minerals. (1)

At the same time the investigations provided excellent food for study in the way of improvement in the methods of extraction, manufacture and sale of the various products (2). And it seems besides that the discovery of new deposits is continually being announced and that the resources of phosphatic minerals hitherto known in the United States are sufficient to remove all fear of their becoming exhausted.

As regards nitrogenous fertilisers, although attention has been drawn to possible deposits of nitrates in the arid and semi-arid regions of the United States (3), still, when they do exist, they are either too small to be utilised from a commercial standpoint, or too inaccessible to means of transport or manufacture, or else are of doubtful economic value. But, although the utilisation of such deposits is still an open question, it is nevertheless worth while to take their existence into account. Among other investigated sources of nitrogenous fertilisers, it seems there is a strong tendency to introduce coke stoves into the principal carboniferous regions; so that considerable quantities of sulphate of ammonia, hitherto unnoticed will be rendered available for use.

Special interest has been shown in the study of potassic manures, in consideration of the fact of depending on the German product and the obvious advantage of one that is local and American. The following are considered to be among the possible sources of potassium:

a) The immense accumulations of saw-dust in the timber-producing regions.

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(1) See *B.* Aug.-Sept. Oct. 1911, No. 2520.
(2) See *B.* March. 1911, No. 776.
(3) See *B.* Feb. 1911, No. 309. (*Ed.*).

b) The re.use of sugar-factories.

c) Water used in washing wool.

d) Possible deposits lying below existing deposits of rock-salt, or under the present surface of dried-up seas or lakes.

e) Natural silicates of potassium.

f) Seaweeds.

The three last sources are worthy of special consideration.

The basins of dried-up regions are now explored by Government agents for the purpose of taking note of possible surface deposits of potash, or nitrates.

With regard to natural potassic silicates, extensive deposits of them exist in the United States, such as feldspars, glauconites, leucites; and the chemical laboratories of the Ministry of Agriculture and of Agricultural Institutes, as well as private enterprise, are all making serious enquiries as to the possible methods of extracting potassium. But the amount of energy required to separate the chemical combinations of such materials and extract the potash, is so great that for the present at least it makes the production prohibitive. Only the very cheapest form of energy, whether generated by electricity or heat; or the production of secondary products of low value (cement) (1) can render it possible for potassic silicates to be utilised commercially.

But the most promising source of potassium is that of the immense extents of seaweed (kelp) along the Pacific coast. From the careful estimate made after the earliest investigations, this growth of seaweed apparently covers an area of 100 sq. miles (2) and is capable of yielding 1 000 000 tons of chloride of potash worth $35 000 000, about three times the amount of the present importation of salts of potash. And the development of this growth would in nowise be compromised by the present crop being gathered.

Besides this, innumerable other areas of similar nature remain to be investigated and made known. With regard to the methods of gathering and treating the raw material, there are still many mechanical difficulties to overcome; but the fact, certified by public laboratories, that iodine and other useful products may be extracted from the seaweeds under consideration, will pave the way for their being gathered for the extraction of potash. (3)

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(1) B. Herstein. Potash from Feldspar. *The Journal of Industrial and Engineering Chemistry*. Vol. 3, N° 6, pp. 426-428; Easton, Pa. June, 1911.

(2) In the bays of the north-western part of the State of Washington.

(3) See *B*. Jan. 1911, No. 69. (*Ed.*).

The report of this work ends by pointing out that the certified facts of possible resources of fertilising matters in the United States and the ever increasing need for them render the eventual utility of such investigations so great that the cost is inconsiderable; consequently it is well worth while to provide ample funds for their continuation.

AGRICULTURAL BOTANY.

CHEMISTRY AND PHYSIOLOGY OF PLANTS.

493 BIRGER, KAJANUS. **On the Germination Energy of Red Clover Seed.** — (Über die Keimenenergie des Rotkleesamens). — *Landwirtschaftliche Jahrbücher*; *Zeitschrift für wissenschaftliche Landwirtschaft*, Band XLI, Heft 3-4, pp. 527-533. Berlin, 1911.

Sweden

This article gives an account of the results of much research and of many experiments undertaken for the purpose of determining whether the different coloration of the seeds of red clover has any relation to their power of germination.

Of each type of red clover three lots of seeds were selected: violet, yellow and brown respectively, each containing 200 seeds which were placed on germinating beds of filter-paper and felt; these were covered with bell-glasses perforated at the top and kept moist by means of a wick placed in a vessel of water. The temperature was kept between 18° C and 30° C. The data furnished by these experiments are incorporated in a table, and the results may be summarized as follows:

1. Violet seeds are much heavier than yellow or brown.

2. Brown seeds have less germinating power than violet and yellow.

3. Brown and yellow seeds do not differ much in weight.

4. Yellow and violet seeds germinate almost equally well, but the yellow seeds are always somewhat inferior to the violet.

The percentage of hard seeds varies greatly, but the number of such seeds is, on an overage, least among the violet, and greatest among the brown, which explains the fact that the latter germinate much more slowly. No definite relation however appears to exist between weight and germinating power; the yellow seeds which were

lighter than the violet, nevertheless, germinated in five cases faster than the latter.

Other experiments made with seeds from different localities show that germinating power and the percentage of hard seeds are very variable and, apparently, have no connection with the colour.

The slow germination of the brown seeds doubtless depends upon a chemical change in the testa. It cannot be absolutely denied that there is some correlation between germination and colour, since the former depends, not only on the anatomical structure, but also upon the chemico-physical properties of the testa.

What these properties really are, and their relation to colour, cannot yet be determined with any certainty.

PANTANELLI, E. and SEVERINI, G. **The Ammoniacal Nutrition of Green Plants.** (Ulteriori esperienzè sulla nutrizione ammoniacale delle piante verdi). — *Le Stazioni sperimentali agrarie italiane,* Vol. XLIV, F. 11-12, pp. 873-908. Modena, 1911. **494**

Experiments in growing spring wheat and white mustard in calcareous sand to the point of seed-bearing and maturity. All the nutritive elements were given to the various cultures in the same quantities, except the anions combined with ammonia (chlorine, phosphoric, succinic, tartaric, citric); further the experiments were carried out with carefully sterilized soil, so as to exclude any possibility of nitrification. **Italy**

The results obtained confirmed the previous experiments which were made with young plants and which led to the following general conclusions :

1) Nitric nitrogen, in the case of wheat and mustard, caused the maximum vegetative growth (stalks, leaves, etc.) but sometimes one ammonium salt, sometimes another, had a greater effect upon the production of seed.

The injurious effects of the exclusive absorption of ammonium were caused by the salt of the strongest mineral acid, the chloride; the citrate had the same effect in the case of the mustard. The diammonium phosphate again showed its great nutritive value, which in the case of the two plants, was little inferior to that of the nitrate.

The three soluble organic ammonium salts gave rise in the case of the wheat to good fructification and to a fair vegetative growth; they were not so beneficial to the mustard, by which even the citrate was not assimilated.

The four insoluble double salts of ammonium (with magnesium, calcium, ferrous iron and manganese) also proved to be of much nutritive benefit to the wheat, but they had less effect upon the mustard, especially with regard to vegetative development. Further, this plant made no use of the ammonium-magnesium phosphate.

The reasons of the different behaviour of the two plants are:

a) The weaker acid secretion of mustard roots, which hindered the action of the insoluble phosphate.

b) Large reserves in the wheat grain and the development of a strong root-system, which produced a need of nitrogen and caused the rapid disintegration of the solid components of the soil.

2) The best utilization of nitrogen in the formation of dry matter by the wheat proved to be obtained with organic salts of ammonium in the first place, with insoluble phosphates of ammonium in the second, and lastly with the nitrate, to which, from this point of view, only ammonium phosphate and ammonium chloride proved themselves to be inferior.

The nitrogen content varies generally inversely to the development, and the large amount of this element was the index or a cause of sterility in wheat. The mustard was able to make more use of nitrogen absorbed in the ammoniacal form than in the nitric as far as the dry matter of the vegetative parts was concerned, and this plant produced with the former a much larger quantity of seeds rich in nitrogen; but as the mustard grows more rapidly and develops more before bearing seed, when supplied with nitrate, it follows that the absolute amount of nitrogen absorbed, and of dry matter produced, is greater in this case. Soluble phosphorus and the organic salts of ammonium promote the formation of albumen more readily than nitrate in both wheat and mustard.

3) The absolute quantity of water which is transpired varies in proportion to the development of the plant.

The transpiration unit, that is to say the amount of water given off by a given mass of the transpiration organ, depends on the activity of root-absorption.

Thus, chlorine in the case of the wheat, and the organic acid radicles in that of the mustard, were absorbed more slowly than ammonium and caused an increase of osmotic pressure, thus lowering the root-absorption and, as a result, decreasing the transpiration.

The utilization, in the construction of organs, of the water absorbed was generally better when the plants were furnished with ammoniacal nitrogen.

4) To sum up: ammoniacal nitrogen has, in itself, a higher nutritive value than that possessed by nitric nitrogen, but it can only be utilized under the following conditions, when:

a) the ammonium cation is absorbed slowly by the roots;

b) the ratio between the rates of absorption by the roots of ammonium and of the accompanying anion approaches 1;

c) the anion itself has a nutritive value.

The two last factors have naturally a specific character. Further experiments are being made with fewer compounds of ammonium and a greater number of species of agricultural plants.

The researches were carried out at the Botanical Institute of the Royal Institute of Agriculture at Perugia, and the analyses were made in the Royal Station of Plant pathology in Rome.

BERNANDINI, L. and MORELLI, G. **On the Physiological Rôle of Magnesium in Green Plants.** (Sull'ufficio fisiologico del magnesio nella pianta verde). — *Rendiconti della Società Chimica Italiana.* Serie II, Vol. III, Fasc. XIII, pp. 349-353. Roma, 25 Gennaio 1912. **495**

Italy

In a preceding note, it was shown by one of the authors that the assimilation of phosphoric acid by green plants is determined by the relative amounts of magnesium which have been absorbed in conformity with the ratio $\frac{\text{lime}}{\text{magnesium}}$: phosphorus pentoxide, which is present in the economy of higher plants.

In a more recent note on the composition of the rice embryo (1), after having drawn attention to its high content of phosphorus in the form of phytine, the writer shows, from data obtained from analysis, that the phytine in the rice embryo is in the form of the magnesium salt of phytic acid, although usually considered to be the magnesium-calcium salt.

The presence of relatively large quantities of phosphorus in the form of the magnesium salt of phytic acid, which is easily hydrolised by enzyme action, leads to the conclusion that phytine is the form in which the plant stores up the reserve of phosphoric acid which is transported in the form of magnesium phosphate.

In the present researches, the investigators observed in wheat germinating in darkness, and also in light, the evolution of organic phosphorus and that of magnesium compounds in the form of salts of organic and inorganic phosphorus.

(1) See *B.* March 1911, No. 738. (*Ed.*).

From analysis, the following results were obtained:

1) During germination in darkness, the phosphorus of the compounds of organic phosphorus, known as phosphatides, and the phytic phosphorus, continually decrease, and the destruction of the phytine follows the progress of enzyme action; at the same time, the phosphorus soluble in 1 % hydrochloric acid remains relatively constant.

2) In germination in darkness, the magnesium soluble in 1 % hydrochloric acid remains relatively constant, while that which is soluble in water increases with the decrease of the phytic phosphorus.

3) In germination in light, when the young plant begins to become green, the phosphorus in the form of phosphatides commences also to increase, while the phytic phosphorus does not; under the same conditions, the magnesium soluble in water increases at first, but begins to diminish on the appearance of the chlorophyll.

Thus it is proved, that the transport of reserve phosphorus to the parts where it is utilized, and where synthesis takes place, is effected by means of the magnesium, showing that the latter plays a very important part in the economy of the green plant. The magnesium renders the phosphoric acid transportable, and carries it from the reserve store to the places where synthesis is carried out, where this acid is utilized in the formation of the plastic phospho-organic substances which constitute the cell, while the magnesium is employed in the construction of the chlorophyll molecule.

SELECTION.

496 LEHN, D. **A Contribution to the Question of Correlation in Rye.** — (Ein Beitrag zur Frage der Korrelationen bei Roggen). — *Illustrierte Landwirtschaftliche Zeitung*, 32. Jahrgang, Nr. 3, pp. 13-14. Berlin, 10. Januar 1912.

Except in the case of the sugar-beet, we have, at present, as far as correlation in cultivated plants is concerned, to rely chiefly upon hypotheses.

Germany

The clear establishment of the existence of correlation, and the relation between correlated characters is of great importance, not only from the scientific standpoint, but also from the practical. Hence the value of the present article which gives the results of numerous researches on the correlative characters of rye.

The figures are taken from the breeding registers of C. Krafft-Buir and refer to Zeeländer rye, which this investigator has improved by means of a system of individual selection carried out for ten years. The extraordinary tendency to variation shown of late years, and the correlation (visible even to the naked eye) between certain morphological characters, caused him to investigate the data mathematically. For the year 1908, the figures refer to 62 plants divided into three groups according to length of straw: 1) short, up to 140 cm. (55 in.); 2) medium, 140-150 cm. (55 to 59 in.); 3) long, more than 150 cm. (59 in.). The relation existing between length of straw and other characters is shown in table No. 1.

Length of straw is accompanied by longer ears, more internodes, increased weight of grain per ear and per thousand; while on the other hand, the total weight of the plant, the number of haulms, and the weight of grain per plant diminish. In 1909 there was more material at disposal. The data refer to 132 plants, divided into three groups, according to the length of the straw: up to 130 cm. (51 in.); 130-137 cm. (51 to 54 in.); above 137 cm. (54 in.). The results (see table) established clearly the relation between length of stalk and number of grains per ear, which could not be done with certainty the preceding year.

The researches conducted in 1910 and 1911 led to the same conclusions.

When from the material used in the four years, we take the average of each of the three groups, the correlation of the single characters comes out clearly.

Increase in straw-length is directly correlated with:

1) Length of ear.
2) Number of internodes.
3) Weight of grain per ear.
4) Number of grains per ear.
5) Weight of 1000 grains.

While the following characteristics are in inverse relation to the straw-length:

1) Weight of plant.
2) Number of haulms.
3) Density of ears.
4) Weight of grain per plant.
5) Percentage of grain.

It would be interesting to find out whether these facts also apply to other cultivated types of rye; experiments in this direction would show whether the above mentioned correlation applies only to "Zeeländer", or admits of a more general application.

	Number of plants	Medium length of haulms in feet	Weight of plant in grams	Number of haulms	Length of ears in inches	Number of internodes	No. of spikelets on 3.93 inches o f ear	Weigt of Grain in grams per		Number of grains per ear	Weight of 1 000 grains in grams	Percentage of grains
								Plant	Ear			
Short plants	21	4.32	29.7	6.3	0.43	5.2	32.4	13.3	2.2	62.1	35.4	44.8
Medium »	23	4.72	25.7	5.2	0.43	5.3	32.3	11.9	2.2	60.4	36.9	44.2
Long »	18	5.02	24.3	4.4	0.45	5.4	31.0	10.2	2.3	62.9	37.3	42.4
Short plants	45	3.91	32.7	7.7	0.38	4.8	32.6	14.2	1.9	54.1	34.9	43.9
Medium »	35	4.39	31.5	6.8	0.41	5.1	30.9	13.8	2.1	55.4	36.6	43.0
Long »	54	4.69	33.8	6.7	0.44	5.1	30.1	14.0	2.1	57.9	36.5	41.3
Short plants	73	4.18	33.3	6.7	0.44	5.1	31.4	13.8	2.1	59.1	36.7	42.4
Medium »	62	4.53	30.9	5.9	0.44	5.2	31.1	12.4	2.2	59.9	36.6	41.1
Long »	77	4.84	31.6	5.5	0.46	5.3	31.2	12.5	2.3	60.8	37.6	40.2
Short plants	41	4.26	31.5	6.4	0.40	4.7	32.0	13.4	2.1	56.8	37.5	42.3
Medium »	30	4.51	29.6	5.7	0.40	4.7	32.7	12.7	2.2	58.9	36.9	42.6
Long »	49	4.76	28.3	5.3	0.42	4.9	31.3	11.7	2.2	59.7	39.7	41.3
Short plants	178	4.17	31.8	6.5	0.41	4.9	32.1	13.7	2.1	58.0	36.1	43.3
Medium »	150	4.54	29.3	5.9	0.42	5.1	31.7	12.7	2.2	58.6	36.7	42.7
Long »	198	4.83	29.5	5.5	0.44	5.2	30.9	12.1	2.2	60.4	37.8	41.1

Cook, O. F. **Dimorphic Leaves of Cotton and Allied Plants in Relation to Heredity.** — *U. S. Dept. af Agric., Bureau of Plant Industry, Bull.* No. 221, pp. 59, figs. 17, pls. V. Washington; November 22, 1911. 497

The most important of the general facts or principles of heredity that may be illustrated by the phenomena of dimorphism is the fundamental distinction between expression and transmission. Unless this distinction is appreciated it is impossible to understand the measures of selective breeding that are required to preserve the uniformity and maintain the agricultural value of superior varieties of cotton and other seed-propagated crops. United States

The facts of heredity that promise to be of most value from the standpoint of agricultural application are facts of expression. Even without determining the mechanism of transmission it is possible to investigate the effects of breeding and environment upon the expression of characters.

If there were a complete correspondence between expression and transmission, the characters of a pure-bred uniform variety might be expected to remain fixed for all time, and further selection would be entirely unnecessary. But in reality such is not the case, and the appearance of new characters is frequently recognized, even in plants reproduced vegetatively.

The development of any individual plant may be viewed as a progressive change of expression of characters, the juvenile characters giving place to the adult; but the changes are generally so gradual as to suggest no analogy with the Mendelian form of definitely contrasted alternative inheritance. In the case of cotton and Hibiscus, however, it appears that Mendelian relations exist in characters that are also subject to abrupt change during individual development. The same characters that show contrasted expression in Mendelian hybrids may be as definitely contrasted, in related plants, in the growth of each individual. Mendelism, like the dimorphic differences, may be looked upon as representing alternative expression of characters.

A very pronounced example of dimorphism of leaves has been observed in *Hibiscus cannabinus*, the so-called. Deccan hemp, in Egypt. The leaves of the upper part are deeply tripartite, while the lower ones are entire. These variations show a curious parallelism with those in cotton: the ordinary Upland varieties have entire leaves, while the " Okra " varieties have them deeply trilobed.

The Hibiscus leaves show a very abrupt transition from one form to the other; and it has been found that Mendelian segrega-

tion of the broad and narrow forms of leaves occurs in the second generation of crosses between varieties of cotton representing the two types of leaves. The hemp plants with the two kinds of leaves represent a segregation of characters among the internode members of the same plant. It is possible that the different forms of the leaves may be connected with the fact that there is a difference of function among the internodes of the stalk.

The internodes of the upper part of the stalk produce fruit or fruiting branches, while those of the lower part do not. Some of the lower internodes of the cotton stalk give rise to large vegetative limbs with the same functions as the stalk, while other internodes produce only small abortive branches or none at all. Several of the barren internodes usually intervene between the highest of the vegetative limbs and the lowest of the functional branches, as though it were difficult to change abruptly from one form of branch to the other.

In Deccan hemp and the okra plant (*Abelmoschus esculentus*) the fruits are borne directly at the axils of the main stalk without the intervention of fruiting branches. It may be that the divided leaves indicate in advance the internodes that are to produce flowers and fruit. The nodes of the stalks of the cotton-plant may thus be considered dimorphic because of the two types of branch they may produce.

In Upland varieties of cotton the fruiting branches are produced closer to the base of the plant than in the Egyptian cotton, and the seedlings of Upland cotton also begin to produce lobed leaves at earlier stages than Egyptian seedlings.

There is then a general parallelism between the leaf-variations occurring in numerous species and varieties of cotton and those of certain other plants.

The definite changes of characters involved in passing from one form of leaves or branches to another are analogous to the abrupt transformations that take place in mutative variations.

Dimorphic differences and mutations show that abrupt changes of characters are to be considered as phenomena of alternative expression. It is obvious that such changes are not determined by alternative transmission, as often alleged for Mendelian segregation of contrasted characters.

The same kinds of characters show dimorphic specialization in individual plants and Mendelian segregation in hybrids. Dimorphism and Mendelism may both be interpreted as phenomena of alternative expression.

The general interest of such phenomena is in their relation to the recognition of a fundamental distinction between transmission and expression as a general law or principle of heredity. The facts of heredity and breeding can be better understood if transmission be considered as including the whole ancestral series of characters. Transmission inheritance is a comprehensive process, while expression inheritance is partial and alternative, different characters being expressed in different individuals or in different stages of individual development.

The facts of dimorphism are worthy of being taken into account in breeding, as one of the means of recognizing variations from the standard or typical form of a select variety.

Though different kinds of leaves or branches represent very different facts of heredity, yet the expression of such characters can be influenced by external conditions. Thus it has been found that new conditions may seriously disturb the expression of characters in the cotton plant, even to the extent of a complete suppression of the fruiting branches.

For the purposes of the selection that has to be maintained in order to keep a superior stock in a condition of uniformity, it is very important to recognize varieties by the characters of their leaves and branches. Indeed, selection by vegetative characters can be made even more efficient than selection by fruit characters because it enables degenerate variations to be recognized and removed early in the season, thus avoiding the danger of spreading inferior characters through cross-pollination.

Selection is our means of keeping undesirable characters from coming into expression, but it does not prevent their transmission, Even though all the lines of descent that show tendencies to the expression of undesirable characters be rejected, the possibilities of such expression remain in the other lines and are likely to be reawakened if selection be relaxed. One of the most important problems in the selective breeding of cotton and other seed-propagated field crops is to make selection more efficient by more adequate knowledge of the characteristics and behavior of the plants, so that deviations from a type can be more easily recognized and removed from the stock and the exciting causes of such deviations avoided.

CEREAL AND PULSE CROPS.

498 OLIVA, ALBERTO. **Yields of Wheat in Mountain Regions.** (In montagna si possono ottenere delle alte produzioni di frumento?) — *Relazione di un concorso a premi fra i coltivatori di frumento del Circondario di Borgotaro (Parma) nell'annata 1910-1911*, 1 Opusc., pp. 24. Parma, 1911.

Italy

The Borgotaro section of the Travelling Lectureship of Agriculture of Parma opened a prize competition among wheat growers of the district in the autumn of 1910, in order, by means of extensive experimental fields to give practical demonstration of the possibility of growing profitable crops of wheat in mountain regions.

The regulations for the competition are here briefly given.

1. Extent of the field to be not less than $^4/_5$ of an acre.

2. The field to be in rational relationship to the artificial meadow (lucerne or clover).

3. The judges will examine the sections in competition at repeated intervals, as well as being present at the cutting and threshing of the wheat.

4. The verdict given will be guided :

a) by the rotation adopted ; *b*) by the preparation of the soil ; *c*) by the manuring ; *d*) by the choice and preparation of the seed ; *e*) by care in cultivation.

The stipulation made by the promoters of this competition, *viz.* that the average production should be 20 qls. per ha. (30 bu. per acre), was more than fulfilled.

In the Mid-Apennine district of Borgotaro, in soil of normal situation and fertility, more than 30 qls. per ha. (45 bu. per acre) were produced with ordinary care, in 1911.

These figures and results give every reason to consider the question as to the possibility of obtaining a rich harvest of wheat cultivated in mountain valleys even at a height of 800m. (2630 ft.) above the sea, to have been satisfactorily answered by proved facts.

The rotation of crops in the Apennines has hitherto been limited to the disastrous alternation of maize and wheat ; disastrous because it impoverishes the soil, tending to lower the production of wheat and prevent the production of maize. This is in fact the

rotation of 5 or 6 qls. per ha. (7 ½ to 9 bu. per ac.) of wheat, which led to the condemnation of wheat growing in the mountains. That is why the rotation lucerne or clover (chemically manured) and corn has been insisted on for the Apennines. That this change has been beneficial is proved by facts. Wheat after lucerne began, more than ten years ago, to produce twice the former amount, viz. 12 qls. (17 bu.) which has increased to 15, 20 and 30 qls. (22,30 and 45 bu.). The preparation of the soil for wheat hitherto adopted was a consequence of the old maize — wheat rotation; the soil was ploughed in October with a little wooden plough and the seed sown immediately after. But the farmers who took part in the competition ploughed or dug the ground thoroughly in August-September with what results the event proved. They used two excellent mountain ploughs, Sack W 10 and Melotte 2.

For chemical manuring only two mixtures were advised, which had long been used with the best results.

1. For wheat after manured leguminous plants.

Superphosphate (15-17 % P_2O_5) . . .	2 ½ cwt.
Nitrate of soda	3/4 »

2. For wheat after non-manured leguminous plants.

Superphosphate (15-17 % P_2O_5) . . .	2 ½ cwt.
Sulphate of ammonia	3/4 »
Sulphate of potash	½ »
Nitrate of soda	½ »

The varieties of wheat employed in these experiments were "Rieti" and "Gentile Rosso" and to a small extent "Cologna" and "Noè". The "Gentile Rosso", owing to its high yields — though it is subject to rust in the valley bottoms, is yearly gaining ground from "Rieti"; and its superiority has been incontestably confirmed by these experiments.

As regards seed, the local custom is to sow about 110 kg. per ha. (6 ½ pecks per acre), but in practice the tendency, and rightly so, is to increase this to 120 or 130 kg. (7 or 8 pecks), as oftener than not the seed was too thinly sown.

In face of the extraordinary results of this competition, it seems well to quote a few figures, in anticipation of the objection that if the production is considerable, so are the expenses.

By the mountain basehold system " mezzadria " (or land held on condition of proprietor's receiving one half of the produce) the bulk of the expenses incurred by the landlord consists in chemical manure.

The land-tax and general expenses are always the same ; with this advantage, that a high rate of production is maintained by rational methods for the improvement of the soil. The landlord's maximum outlay for manure is roughly 59 lire per ha. (18*s* 10*d* per ac.) (1), against a minimum increase of crop, reckoning the landlord's share, of 5 qls. (7 ½ bu. per ac.) of grain ; which, at 26 lire the quintal, gives a return of 130 lire per ha. (£2.1*s* 7*d* per ac.), this means a minimum profit of about 70 lire per ha. (£1.8*s* 3*d* per ac.) without calculating the value of the straw.

There is no doubt, continues the Author, that the profits of a well ordered system of agriculture carried on by the aid of oxen, would enable small mountain farmers to provide themselves with all the grain indispensible for their needs: but if this is possible and realisable in the future, the present general economical conditions of these farmers must be taken into account. And it must not be forgotten that if wheat, which is already dear, has to be carried up to them, it will be at considerable cost.

But besides these special reasons of a social nature, there are other undeniable and peculiar agronomic conditions in mountain regions which render them more favourable than plains to the cultivation of wheat.

In fact the cultivation of wheat in the mountains is necessary and inevitable. Necessary, because after the breaking up of the artificial meadows with their accumulated fertility, it would be difficult to grow any thing else in them but potatoes ; and indispensable for the existence of clover leys, which it is well-known cannot thrive for more than two years on the same soil.

It is, further, evident that mountain slopes being naturally well drained are less subject to damp and consequent cryptogamic diseases, as well as to lodging, as was shown by these tests.

The corn produced at an elevation of from 600 to 800 m. (2000 to 2600 ft.) in the Apennines (at Berceto, Bardi, Castelnuovo

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(1)

Superphosphate (3 qls.)	24 lire
Sulphate of ammonia (50 kg.)	15 »
Sulphate of potash (30 kg.)	10 »
Nitrate of soda (40 kg.)	10 »

and Pavallo), up to the extreme limit of the chestnut zone, is wonderful, both as to weight and nutritive qualities; the crops of spring wheat are especially fine and often finer than those of autumn, because the period of vegetation is prolonged by 30 or 40 days, thus increasing the nutritive power of the seed, just as in the case of northern countries, the classical home of cereals. In fact our mountains come within the range of those regions most fitted for the cultivation of wheat, in which it is doubtful whether the most fertile plains of Central and Southern Italy can be included, subject as they are to drought and intense summer heat.

In conclusion, when mid-mountain agriculture is based on artificial meadows and pastures (which have a mechanical action on mountain soil similar to woods, and like them tend to consolidate it) the cultivation of wheat becomes inevitable and indispensable, as under such conditions it is possible to obtain harvests as good as and even better and cheaper than can be produced in the plains.

The Cultivation of Barley in Tunis. (Culture des Orges en Tunisie). — *La Vie Agricole et Rurale*, No. 8, pp. 204. Paris, 20 Janvier 1912. 499

Tunis

Thanks to the absence of summer rains, Tunis has excellent barleys to put on the market, both from the point of view of appearance and that of preservation.

The production of barley for brewing purposes can be carried out in two ways:

1. By growing six-rowed barley selected from the local varieties and placed on the market with guarantees of homogeneity and cleanness.

2. By the methodical acclimatization of good kinds of two-rowed barleys introduced from their native countries.

In either case, the suggested improvement presents three phases:

1. Botanical separation of the kinds; comparative study of their cultural value; the search for new types which have appeared spontaneously, or are the results of hybridisation.

This work devolves upon the Experimental Station, and has largely been accomplished as far as the six-rowed barleys are concerned, and is in process of realization in the case of the two-rowed.

2. Trials undertaken in the different districts of Tunis of a certain number of pure races, in order to determine the most favourable conditions for each.

Researches as to the best cultural methods and fertilisers to use for the purpose of obtaining the highest yield compatible with the best industrial properties.

This last part of the problem has been studied by the Station in collaboration with a certain number of agriculturists.

3. Commercial organisation, which would make it possible for the producers to group together similar lots, and to furnish the trade with a homogenous product of determined composition specially grown for the purpose to which it is to be applied.

500 MIKHAILOVSKII, R. **Influence of Meteorological Factors on the Growth of Oats in the Year 1902.** (1) (Vliianie Meteorloghiceskikh Uslovii 1912 Godana Proesrastanie Ovzà). *Jurnal Opetnoi Agronomii* (Review of Experimental Agriculture), G. XII, pp. 925-926. S. Peterburg, 1911.

Russia

The results are given of a series of observations made by the Author in the experimental ground annexed to the School of Obitoceask (Government of Taurida) for the purpose of determining the influence of meteorological agents on the growth of oats.

The growth of oats is considered to be divided into three distinct periods:

1) From the moment of sowing to the appearance of the young shoots at the surface.

2) From the sprouting of the young plant to the forming of the ears.

3) From the forming of the ear to the harvest.

The second period determined the number of stalks, the development of leaves and the increase of organic matter in the tissues of the plant.

But external growth as well as that of organic substances is not determined by time, but rather by factors of a biological nature.

The third period was marked by accelerated development and precocious maturation caused by high temperature and want of rain during the flowering season as well as during formation of the grain.

It was noticeable too, that under equally unfavourable meteorological conditions, the plants that suffered most were those whose leaves were finest and most developed.

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(1) In spite of the fact that this article refers to observations made a long time ago, it gains considerably in practical interest as applicable to the great drought of last summer over almost the whole of Europe. (*Ed.*).

In brief the excessive heat and want of rain produced the following effects.

1) At harvest-time, 35 % of the ears contained either no seed at all or else it was imperfectly developed.

2) When the plant began to send up stalks 11.7 % of them were destroyed.

And if we take into consideration that the loss at harvest-time, owing to the extreme lightness of the grains, amounted to 13-20 %, we shall see that the total loss owing to unfavourable meteorological conditions reaches 59.7 %.

The article is illustrated by numerous tables of dates and curves.

HECKER, A. **Influence of Weather Factors on the Quality of Barley, Potatoes and Sugar Beet.** (Die Jahreswitterung in ihrem Einflusse auf die Beschaffenheit der Gersten, Kartoffeln und Zuckerrüben). — *Landwirtschaftliche Jahrbücher*, XLI. Band, Heft 3-4, pp. 417-526. Berlin, 1911. **501**

The study of the action of weather factors on crops would be easy enough if it could be exactly ascertained what are the needs in the shape of light, rain, etc. of cultivated plants. **Germany**

Reliable data in this connection are only available with regard to the factor "rain", and are due chiefly to the investigations of Remy.

The following table relates to barley; the particulars as to rainfall are those for Bonn, the climate of which represents the average general conditions of Western Prussia, Mecklenburg, Brandenburg, etc., a vast area where barley is grown for brewing purposes.

Periods	Water requirements of barley in tons per acre	Quantity of rain-water placed at the disposal of the plants in tons per acre	Surplus or deficit in tons per acre
From 15th March to 1st May	44	252	+ 208
From 1st May to 1st June .	456	336	— 128
From 15th July to 1st August	428	444	+ 16

Taking into account the comparative shortness of the period of growth, the water requirement is very high, especially during the period of growth in height.

Thus, while at the beginning of spring, when growth takes place at the expense of the moisture held in reserve in the tissues, the most important weather factor is temperature, at the end of spring and during summer the conditions of growth are directly influenced by the quantity of rainfall. The less clear and definite the action of any factor, the more that of other factors becomes accentuated and the more difficult is it to judge the effect of variation of the different factors.

The Author regards the nitrogen percentage of the caryopses as the index of larger or smaller yield and after a lengthy detailed discussion of the many meteorological, phenological and statistical data, he sets out the following interesting conclusions:

1. The weather during the last few weeks before ripening exerts a decisive action on the quality of malting barley. A dry and not very wet July is favourable; an over-wet July on the contrary unfavourably affects the quality of the grain. Excessive drought on the other hand results in incomplete ripening and increases the contents of albuminoids.

2. Moderate moisture, even less than the normal, accompanied by a rather low temperature, is the most certain guarantee of a good crop from the point of view of both quality and quantity.

3. Low temperatures and a feeble amount of sunlight are not detrimental to the formation of a good malting barley. Quite the contrary, it may be affirmed that cold in June and in July has an advantageous effect on the quality and likewise on the quantity of the grain.

4. Heavy rain showers, which are generally connected with a high temperature and high hygroscopic indications, reduce the contents of albuminoids.

5. The bad effect produced by excessive rainfall in July is very much mitigated when the weather at the same time remains cold and overcast.

6. The time of sowing does not appear to exert any specific action on the quality of the barley.

Influence of weather factors on the quality of potato tubers.

Periods	Water requirements of potatoes in tons per acre	Quantity of (rain)water at the disposal of the potatoes in tons per acre (Bonn)	Surplus in tons
From 15th March to 1st May	—	252	+ 252
From 1st May to 15th June	72	328	+ 256
From 15th June to 1st August . . .	292	444	+ 152
From 1st August to 30th September .	256	388	+ 132

From the very many data given, and considerations brought forward, by the Author, the following general conclusions may be drawn:

1. Excessively wet weather always influences the quality of potatoes unfavourably, especially at the time of flowering, when the tubers dovelop and the process of ripening is gradually taking place.

2. Over-dry weather reduces the quality and quantity of the potatoes. The quality especially suffers when the period of drought coincides with the first or second phase of growth (July).

3. Alternating dry and wet weather. A great deal of wet after a dry period is dangerous to quality; on the other hand the occurrence of drought after abundant rains unfavourably affects the quantity of the crop.

4. Changeable, cold and rainy weather during the second period of growth (in July for the medium and late varieties) does not seem to have any disadvantageous effect.

5. Low temperatures involve no risk to the good quality of the crop, if the other factors of growth (rainfall) are favourable.

6. Hot, wet weather is detrimental to the quality of the tubers.

Influence of weather factors on the properties of sugar beet.

The following are the most important conclusions, drawn from the results of a large number of well conducted experiments, and based on abundant data:

1. Moderate rains from May to the middle of June, abundant from the middle of June to the beginning of August, moderate in August, scarce in September and October, produce a good crop of beet in point of quality.

The following table contains the particulars of the beet crop in Western Prussia and the Rhine provinces:

	Western Prussia		Rhenish Provinces	
	Average rainfall of 4 seasons in inches	Percentage of sugar in beets	Average rainfall of 4 seasons in inches	Percentage of sugar in beets
April	5.5		13.8	
May	7.8		30.3	
June	14.2		22.8	
July	21.3	15.03	40.2	12.87
August . . .	9.8		34.6	
September .	10.6		4.7	
October. . .	10.6		34.2	

2. Plentiful rain from June to the beginning of August is indispensable to a good beet crop. It in some measure fosters an earlier growth in bulk of the crop and prevents this bulk growth from taking place in autumn, that is, at the time when it is desirable that quality should play the leading part.

3. Dry weather in August and September (up to the end of the vegetative period) or in September and October (till the harvest) improves the quality of the crop.

4. Wet weather before ripening or lifting, following on a dry, hot and sunny season, is disadvantageous to the quality of the crop.

5. A wet summer produces the same effects as indicated in No. 4.

6. Excessive rains in August and September or in September and October, and even in October alone, are always injurious; they deteriorate the quality of the produce.

7. Sunlight and temperature have only a very restricted effect on the crop value.

FORAGE CROPS. MEADOWS, AND PASTURES.

LANG, DR. H. **Promoting the Growing of Forage Crops in Districts of Small and Medium Farms.** (Die Förderung des Futterbaues in Gegenden mit Klein- und Mittelbetrieb). — *Illustrierte Landwirtschaftliche Zeitung*, 32. Jahrgang, Nr. 2. pp. 5-7. Berlin, 6. Januar 1912. **502**

Germany

The Agricultural Association of Baden and the Chamber of Agriculture for Baden in 1911 established an Advising Office in connection with forage crops, which is combined with the State Seed station of Hochburg, and is chiefly intended to supply farmers with indications in connection with putting down land to meadow or pasture. Together with the weekly Journal of the Association, a question sheet is sent out to farmers in the spring. This sheet contains all data which are of importance for the preparation of a mixture of seeds for a given piece of land (height above sea level, climate, slope, nature and moisture of soil, whether to be put down to meadow or pasture land, etc.). Farmers desiring advice fill up the question sheet and return it to the Advising Office. The latter then draws up a list of the most suitable forage seeds, and, in 1911, gave orders to various seed dealers to deliver the seeds in question to the farmer. The execution of these orders by the dealers leaving much to be desired in many instances, the Hochburg State Seed station will from 1912 onwards, prepare the seed mixtures itself and forward them to the farmers direct. By wholesale purchase and careful examination of the seeds, the Station, assisted by a grant from the Chamber of Agriculture, will be able to supply farmers with seed mixtures both good and cheap.

For the promotion of forage crops, the Author also advises that the State should, at suitable points throughout the country, carry out experiments in the cultivation of different forage plants, their manuring etc., in order to bring home forcibly to the small farmers everywhere, what can be done by skilful putting down and treatment of meadow and pasture lands.

503 REMY Prof. Dr. TH. **The Value of the Annual Rye Grass.** (Uber den Wert des einjährigen Raygrases). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, 27. Jahrgang, Stück 3, pp. 39-40. Berlin, 20. Januar 1912.

Germany

The Author conducted experiments on the experimental estate of the Agricultural Academy of Bonn-Poppelsdorf, on the best loamy soil free from weeds, during the years 1910 and 1911, with a variety of Italian rye-grass (*Lolium italicum*) and with the so-called annual rye-grass.

In 1910 sowing took place on the 11th March; on the 10th June the first, and on the 1st and 26th August the second cutting was made, and the fodder made into hay. The average yield of hay was 6080 kg. per hectare (48 ½ cwt. per acre). In 1911 Italian and annual rye-grass were sown simultaneously on the 14th March; on the 12th Jnne the first crop and on the 15th July the second crop was cut for hay-making. The annual rye-grass yielded 7700 kg. per ha. (61 ½ cwt. per ac.) and the Italian rye-grass 4450 kg. per ha. (35 ½ cwt. per ac.). The quality of the hay in both cases was of equal excellence.

As the growth of the annual rye-grass is exceedingly rapid and the times of mowing about coincide with those of red clover, it should be valuable for gapping-up clover-leys, especially those that have stood through the winter.

504 WACKER, Prof. DR. **An Experiment in Growing Summer Vetches for Green Fodder.** (Uber einen Anbauversuch mit einigen Sommerwicken als Grünfutterpflanzen). — *Deutsche Landwirtschaftliche Presse*, XXXIX. Jahrgang, No. 5, pp. 43-44. Berlin, 17. Januar 1912.

Germany

In 1911 a comparative growing experiment was carried out on the experimental field of the Agricultural Academy of Hohenheim with:

1. Green fodder mixture (consisting of Swedish fodder peas, ordinary summer vetches, beans and oats.
2. Danube vetches, and
3. Königsberg vetches.

The plots were on fairly heavy loam, and were well manured.

The green fodder mixture was sown on the 24th April, and the vetches on the 13th May, under favourable conditions. At the end of July when the crop was mown the following yields were found per acre:

	tons.	cwt.
Green fodder mixture. . . .	11	16
Danube vetches	11	0
Königsberg vetches	8	16

The green fodder mixture only produced the heaviest yield because it was sown first. The Danube vetch is nearly free from hairs and, for this reason and owing to its good yield, deserves consideration for cattle feeding.

WRIGHT, R. PATRICK. **Report on an Experiment on the Cultivation of Lucerne in Scotland and the Effects of Inoculation (1905-1909).** — *Report of West of Scotland Agric. College*, pp. 159-170. Glasgow, 1911. 505

This experiment was primarily designed to determine whether the lucerne crop could be successfully grown in Scotland.

Scotland

In many parts of the world lucerne forms the most productive, the most nutritious, and the most highly valued of all crops for the provision, either of green forage, or of hay suitable for consumption by all kinds of farm stock.

It does best in dry and warm climates, and the failure of numerous previous attempts to grow lucerne in Scotland has been put down to the climate being cold and wet.

The writer of this report has, however, grown this plant successfully in his garden, and it also succeeded in a series of small plots laid out in Campbell Park, Glasgow, where the soil consists of clay.

The Experiment Station at Holmes Farm provided an opportunity of trying the growth of lucerne on a larger scale and under fairly suitable conditions.

The field on which the experiment was carried out consisted of a friable loam, well drained and in good condition.

The secret of the previous failures to grow this crop in Scotland was at once revealed. It must not be sown under a covering crop, for it needs abundant light and air, especially in the early stages of growth.

Conclusions to be drawn from the experiment.

1) There is nothing in the climatal conditions of the West of Scotland to prevent the successful cultivation of the lucerne crop on suitable soils.

2) That for successful cultivation, the lucerne must be sown by itself, and not in mixture with other plants or under any covering crop.

3) That it should be sown in rows, so that it may be thoroughly cleaned in the spring of every year. Unless grass and weeds growing up between the rows be regularly removed, they will speedily, in a damp climate, overrun and destroy the crop.

4) That nitrate of soda applied in annual top-dressing is an effective means of supplying the crop with the nitrogen it requires.

5) That the application of a bacterial culture is an equally effective, and a much more economical means of enabling the lucerne plants to obtain the nitrogen they require.

6) That a supply of nitrogen, either in the one form or the other, is essential to the growth of good crops.

7) That supplies of phosphates and of potash are also essential to the production of good crops.

8) That the growth of the lucerne crop is a means of enriching the soil with a large quantity of a highly nitrogenous, and very valuable root residue.

Recommendations.

As the lucerne crop is not at present cultivated in Scotland, the following additional information about it may prove of value to farmers who may think of attempting its growth.

A deep and rather light soil, into which the roots can penetrate freely is the most suitable.

Soils rich in lime are preferable, but in this experiment, the crop in a soil poor in lime gave a yield, on the inoculated plot, on an average of 5 years, of 9 tons 17 ½ cwt. green forage, capable of producing 16 cwt. dried hay, at an average cost in manures during that period of 2 *s.* 6 *d.* per acre.

The green forage, which is highly nutritive, is moderately valued at £1 per ton, and the average return on these five years of £9.16 *s.* per acre is much greater than can be got with as little cost from any hay crop at present grown in Scotland.

The forage may be given to all kinds of farm stock, including pigs, and is specially suitable for milch cows.

If properly manured and kept clean, the lucerne will occupy the ground for a considerable number of years, and it enriches the soil in nitrogen to such a degree as will enable it to produce a succession of good grain, or any other crops which depend on a sufficient supply of nitrogen for their successful growth.

PUGLIESE, A. **The Natural Meadows of Southern Italy. A Botanical, Chemical and Agrarian Study.** — *Le Stazioni sperimentali agrarie italiane*, Vol. XLIV, F. 5-6, 7, 8-9, 10; pp. 317-413, 517-563, 573-668, 733-766. Modena, 1911. **506**

Italy

The Author reminds us that the question of the production of forage in Southern Italy is of unusual importance in the present state of agriculture of that region, being largely connected with its economic and agrarian conditions.

For this reason he has collected from nearly all the southern regions a large number of forage plants, including 66 samples of natural meadow hay, so as to have a pretty complete idea of the botanical nature of the hays in question and to be able to compare botanical discoveries with conclusions as to their chemical composition and feeding value, drawn from the numerous analyses made in the chemical laboratories of Rome and Modena.

The following are the chief conclusions drawn from the botanical and chemical examination of the hays of Southern Italy:

1. The meadow flora of Southern Italy is seen to be remarkably rich in excellent species of forage, while there is no great abundance of those belonging to other families.

2. The majority of the specimens examined, both singly and as a whole, show the usual botanical characters found in natural meadows, *i. e.* a predominance of Gramineae, followed by Leguminosae, then Compositae, Caryophyllaceae, Labiatae, Umbelliferae, Cruciferae, etc.

3. From a chemical point of view, these hays prove to be rather rich in nutritive substances, particularly protein and minerals; their average composition is similar to that of typical, normal hays, and is equal, or sometimes superior, to that of the most highly favoured regions of Italy.

4. The best hays are generally those containing the largest admixture of leguminous plants and which are cut at the right moment; there is no inconsistency between botanical constitution and chemical analysis, but should a case occur seeming to prove the contrary the reason must be sought for in the influence of special surroundings and methods of culture.

5. The hays of higher altitudes have a much more varied flora, with a frequent predominance of Gramineae; their chemical composition is often inferior to that of the hay of plains and valleys, which does not seem to confirm the prevalent notion that hay grown in elevated regions is all the richer for being exposed to more intense insolation. This defective composition may either be a con-

sequence of the comparatively small importance of radiation, or more probably to the predominance of the Gramineae.

6. As regards the influence of the soil, analysis does not furnish definite conclusions; but it is noticeable that in clay soils or those almost entirely so, leguminous plants predominate and the hay is richer; whilst in calcareous soils, grasses predominate and the hay is poorer.

A few meteorological observations made in the regions under consideration are worthy of notice:

a) Frequent and marked changes of temperature, as well as excessive maxima are unfavourable to vegetation and hence to the normal growth of the meadow all the year round.

b) Another condition which hinders the progress of vegetation in the meadows of Southern Italy is the irregular distribution of the rainfall throughout the year.

c) The optimum of atmospheric precipitation, 1000 mm. (39.4 in.) is, with few exceptions (Avellino, Caserta) never reached in any province of Southern Italy.

The Author finally suggests the following remedies for the wretched condition of the Apennine pastures.

I. Technical.

1. Improvement of the flora; 2, manuring with the twofold aim of improving the product and lessening the struggle against weeds; 3, precautions against landslips, removal of stoves, construction of terraces; 4, planting woods, regularisation of the course of torrents, drainage of damp soils, irrigation, construction of mountain reservoirs, laying out roads, building shelters, etc.; 5, agrarian propaganda, publications, prize competitions, etc.

II. Economical:

1. Co-operation; 2, Government provisions.

With regard to the latter, he quotes the Italian law of 5th April 1908, which aims: *a*) at transforming the ownership of the property of societies and communes, and organising it on a co-operative basis; *b*) improvements in the way of extending the pasturelands, consisting in uprooting bushes, removing stones, draining and filling in marshes; *c*) agrarian improvements consisting in the formation of hay fields, rational use of chemical manures, sowing forage plants; *d*) improvements relating to the management of cattle, consisting in the construction of buildings for housing the herdsmen and for making and preserving the products, of haylofts, stalls, barns, troughs; as well as regulating the means of communication; *e*) improvements in the way of keeping the pastures in proper condition by

means of open drains and culverts, planting of woods, pipes for conveying rain and spring water. At the same time the Author laments the insufficiency of the appropriations here given; for it would require £ 216,000 to carry out such a law, aiming as it does at the improvement of all the pastures of Italy; while only £ 8,000 have been voted, to be distributed in 6 financial years.

FIBRE CROPS.

Cotton Growing in Argentina.

Baumwollkultur in Argentinien. Special Report of the Austro-Hungarian Consul at Buenos Ayres. — *Das Handelsmuseum*, Nr. 1, S. 4-5: Wien, 4 Jänner 1912. Cotton Cultivation in Chaco Territory. — *The Board of Trade Journal*, No. 789, p. 95. London, January 11, 1912. 507

Argentina

The Argentine Government recently submitted to the Chamber of Deputies a bill modifying and increasing import duties on cotton goods. The object of this is to stimulate and defend the national production. It will be operative for 10 years. The proceeds from the increase of duties will go to form a fund intended for the creation of Cotton Experiment Stations. These Stations will have the task of making trials in the cultivation of varieties of cotton adapted to the soil of the subtropical Northern provinces along the upper part of the Paranà: the provinces of Chaco, Formosa, Corrientes and Missiones.

At Resistencia, on the Metan railway, 96 sq. km. (about 37 sq. miles) of land in the territory of Chaco, have been reserved to form the first cotton-growing colony in Argentina. The land will be subdivided into holdings of 50 to 100 hectares (125 to 250 acres), which will be offered to emigrants who are prepared to stay in the Republic, after the present crop, on the express condition that they are devoted wholly and solely to the cultivation of cotton.

The development of cotton-growing in Argentina is shown by the following figures:

1872	403	hectares.
1888	12	»
1895	879	»
1909	1 738	»
1910	2 140	»

In 1911 the area under cotton was trebled.

508 **Cultivation, Preparation and Production of Flax and Linseed.** — *Bulletin of the Imperial Institute*, Vol. IX, No. 4, pp. 355-380. London, 1911.

Flax (*Linum usitatissimum*) is, in Europe, especially grown for its fibre except in Russia, where it is also cultivated for its seed.

In India, the United States, Canada and Argentina, it is chiefly cultivated for the seed. In Argentina a German firm has invented a system of weaving the short fibre of the flax sown for seed. In that country about 3 500 000 tons of flax straw are produced annually, 850 000 of which yield fibre which is used for making fine paper.

The linseed harvested in hot countries is bulkier in appearance than the seed produced in cold countries, but it contains a smaller quantity of oil of inferior quality.

The total area in the world under flax for fibre and seed was distributed as follows in the years 1908 and 1909:

Countries	1908 acres	1909 acres
Austria-Hungary (1)	168 300	111 100
Belgium	51 200	(2)
Bulgaria	300	400
France	70 600	50 500
Italy (2)	—	—
Holland	35 600	24 800
Roumania	44 900	30 100
Russia in Europe	3 401 900	3 274 100
Servia (2)	—	—
Sweden	4 500	(2)
United Kingdom (Ireland)	46 900	38 100
United States	2 679 000	2 742 000
Canada	139 300	138 500
Mexico (2)	—	—
Argentina	3 452 400	3 791 300
Uruguay	63 500	45 300
India, including such Native States as report	2 099 400	2 997 000
Russia in Asia	185 000	328 300
Algeria	1000	(2)

(1) Excluding Bosnia Herzegovina, for which figures are not available

(2) Figures not available.

In Bengal, India, flax is sown in the districts producing indigo. In the Central Provinces, in Berar and in the United Provinces of Agra and Oudh, flax follows rice. In Bombay and Sind, flax is grown on black, moist soils, in rotation with wheat and sorghum. In Egypt it is cultivated in black loamy soils. In the United States, Canada and Argentina, flax is largely grown as a pioneer crop on virgin soils.

The crops are subject to the attacks of the fungi *Fusarium Lini* Bolley, *Melampsora Lini* Tul., *Alternaria* and *Colletotrichum*, and of dodder (*Cuscuta epilinum*).

The following table exhibits the world's production of linseed for the year 1909.

Country	Bushels
Austria-Hungary	1 086 000
Belgium	300 000
Bulgaria	2000
France	436 000
Italy	281 000
Holland	219 000
Roumania	205 000
Russia in Europe	21 298 000
Servia	(1)
Sweden	22 000
United States	25 856 000
Canada	2 213 000
Mexico	150 000
Argentina	41 291 000
Uruguay	522 000
India, including such Native States as report	11 908 000
Russia in Asia	1 844 000
Algeria	10 000
Total	107 643 000

(1) Figures not available.

Flax is cultivated for seed not only in India and Canada, but also in other British Colonies and Dominions, in Australia (especially the State of Victoria) and New South Wales, for instance. Satisfactory experiments have been carried out on the Government farm of Biggenden, Queensland. Experimental cultivations were also made in the Anglo-Egyptian Sudan, in East Africa and in Natal. Flax-growing for fibre is confined to Europe, and to Asiatic Russia.

In 1909 the fibre crop was as follows:

Country	Tons
Austria-Hungary	43 989
Belgium	12 050
Bulgaria	89
France	13 613
Italy	3 232
Holland	5 999
Roumania	727
Russia in Europe	487 082
Russia in Asia	43 036
Servia	491
Sweden	670
Great Britain	7 179
Total	618 157

Canada and Ireland are the only British countries where flax is grown for fibre on a commercial scale. Experimental cultivations are however being carried out in Cyprus, Africa, the Transvaal and Orange River Colony, and on a larger scale in Behar, India. In Australia, experimental growing has proved the possibility of producing flax in the States of Victoria, New South Wales, Queensland and Tasmania.

Belgian flax is fine, long and of excellent colour; Irish flax is famous for its colour and fineness; Italian flax is the most glossy of all; Russian flax is long, but mediocre in quality; French and Dutch flax are very satisfactory in quality.

509 BRUCK, HINDORF, WARBURG and BUSSE. **Textile Plants in Java and the Philippines.** (Fasererkundung auf Java und den Philippinen). — *Verhandlungen des Vorstandes des Kolonial-Wirtschaftlichen Komitees*, Nr. 2, pp. 13-23. Berlin, 28. Nov. 1911.

Java. Philippines

As a matter of fact it is very difficult to draw the line between « fibres » and « hemp » in Anglo-International Commercial nomenclature; all the more that the most important fibrous plant is called « Manila Hemp ».

The total production of fibres in the whole world is 350 000 tons, represented by 170 000 tons of Manila hemp and 100 000 of Mexican sisal; the rest is divided between various species of *Agave* of Central America, the West Indies and the African Colonies.

Mauritius hemp produced by *Fourcroya*, New Zealand flax, Indian hemp, pineapple, ramie, cocoanut etc. are also noteworthy.

To these must be added the real hemps, of which Russia produces 150 000 tons and Italy 80 000. Jute is excluded from this study, the materials made from it being of secondary value.

Manila hemp is cultivated in plantations at Java in conjunction with *Hevea*, which however suffers in consequence, and yields less rubber. Machines are being introduced for the preparation of Manila hemp, and it seems that the natives are increasingly interested in cultivating it.

Manila hemp plantations are also on the increase in the Philippines, especially in Mindanao.

The harvest and preparation of hemp are carried on in the most primitive manner in these islands. In Mindanao however, machines have been introduced. Manila hemp represents little less than half the total export trade of the Philippines. But as exportation increases, the quality diminishes in value.

Good results have also been obtained in both Java and the Philippines by the cultivation of pine-apple and *Hibiscus cannabinus*. Experiments at Manila made with hemp in the manufacture of rope have been successful and point to the advantage of building a rope-factory.

The *Agave Sisalana* in the island of Java continues to produce abundantly up to the age of 8 or 9 years and sometimes even two or three years longer. Under favourable circumstances the crop of dry fibre is 2 ½ tons per bouw (1 *bouw* = 1 ³/₄ acre). Manila hemp grown in Java gives 2 tons per bouw.

German colonial products, in order to hold their own in competition with the Philippines, must include sisal of the highest quality.

Java is the only tropical country besides the Philippines where it has been possible to cultivate Manila hemp successfully.

It has been a failure in every other country.

The problem is to find out whether it is worth while to adopt machines with all the latest improvements, but of great price, to be used in the preparation of the fibre.

RUBBER, GUM AND RESIN PLANTS.

510 **Rubber in the Dutch Colonies, the Malay States and the Gold Coast.** The Netherlands and the late Rubber Exhibition. — *The India Rubber World*, Vol. 45, No. 4, p, 163, New York, Jan. 1, 1912. — Kautschukproduktion der Malayenstaaten. Uber Gummianbau in der Goldküstenkolonie. — *Gummi Zeitung*, Nr. 16, S. 604; S. 604-605. Berlin, 19 Januar 1912.

Dutch Colonies

Holland, whose colonial products were very well represented at the Rubber Exhibition in London, has 217 Rubber growing Companies in its Indian Colonies, *viz.* 102 in Java, 95 in Sumatra, 12 in Borneo and 8 in Riouw.

Of these Companies forty-five sent specimens of rubber to the Exhibition in London.

The production of balata in Surinam which 1893 amounted to 32 524 kg. (32 tons), increased to 890 816 kg. (876 ½ tons) in 1910. Grants of land for the cultivation of balata rose from 172 400 acres in 1893 to 2 201 350 acres in 1910.

Malay States

At Singapore no great feeling of optimism prevails with regard to the production of rubber during the next few years.

And less and less confidence is placed in the assurances of Government that in 1916 the Malay States will be capable of producing 70 000 tons of rubber. This is owing to the waut of capital, which has obliged the Societies to give up planting extensively as was first intended. It is impossible to count on producing more than 40 000 tons by 1916. So far 400 000 acres have been and 700 000 acres still remain to be planted with rubber. £ 59 per planted acre have been invested.

Considering that many of the plantations now in existence will have to be replanted, it may be calculated with certainty that 350 000 acres will be ready to bear by 1916; and taking the average yield to be 250 lbs. per acre, the total returns for 1916 may be estimated at about 40 000 tons. The returns for 1911 are most unlikely to amount to 12 000 tons as expected, judging by the quantity now being accumulated in the ports of Singapore, Penang and Swettenham.

Gold Coast

Great strides have been made in rubber-growing on the Gold Coast. *Hevea Brasiliensis* was first planted in the Botanic Gardens

at Aburi, after which government plantations began to be made at Torkuva, Coomassie and Assuantsi.

India rubber is now cultivated by the Europeans and seeds are distributed to the natives.

The culture of *Funtumia elastica* is also widely diffused, while *Castelloa elastica*, *Manihot Glaziovii* and *Ficus elastica* are still in the experimental stage.

Hevea Brasiliensis, although cultivated in poor soil, is very productive at Aburi, which is about 500 meters (1700 feet) above the sea.

After a trial incision in 44 plants divided into three groups, the result given in the following table were arrived at:

Group —	Number of plants —	Method of incision —	Number of incisions —	Dry Rubber collected gms.	Average per Tree Yield gms.	Average per Tree and incision gms.
I.	15	V-shaped cut.	14	1060	71	4,8
II.	15	Large V-shaped incision and re-opening of scars.	20	1972	131	8,8
III.	14	Half spiral	20	1979	141	9,9

At Tarkwa the results are better, equalling the production of Ceylon and the Malay States. After four and a half years' growth the young plants have a medium circumference of 43 cm. (17 in.).

Incisions made in 5 year-old trees produced 1135 gms. from one, and 1191 gms. from another group of 15 trees.

The experimental plantations at Coomassie are also in a promising condition and the same may be said of those at Assuantsi.

Analyses made of two kinds of Para Rubber from the Gold Coast, have determined its superior quality, as may be deduced from the following table:

	I		II	
Moisture	0,39	%	0,57	%
Rubber.	95,53	»	95,96	»
Resin.	3,90	»	3,25	»
Ash	0,18	»	0,22	»

Plantations of *Funtumia* (*Kickxia*) *elastica* exist at Aburi; Tarkwa and Coomassie. The climate of Aburi is not altogether adapted for the cultivation of the *Funtumia* variety. In fact, in a row of 120 trees which had been planted 6 years, their maximum circumference never exceeded 27 cm. (10 $^2/_3$ in.). At Aburi there are

12 800 *Funtunia* trees. The following are the results of experiments made on 5 groups of these trees with a view to testing their productive capacity:

Group	I	II	III	IV	V
Number of Trees. . .	15	15	15	15	15
Average circumference at 3ft 3 in. above the soil	18.5 in.	18.9 in.	18.3 in.	?	18.5 in.
Method of incision . .	(1) Herring-boned. Seven incisions every ten days	Parallel vertical incisions	Half herring boned. Seven incisions every ten days	(1) Herring-boned. Seven incisions every ten days	Herring-boned. One incision
	gm.	gm.	gm.	gm.	gm.
Total amount of Rubber collected	343	407	260	580	570
Average Amount per Tree	22.9	27.1	17.32	38.6	38
Average amount per Tree and Incision . .	3.26	3.85	2.47	5.50	38

Method V, adopted by the natives gives almost the best results.

The *Funtumia* is cultivated by Europeans on a large scale and the natives too are taking it up with great interest.

VARIOUS CROPS

511 CHARLAN, F., CHEVALIER, O., and BARNET, W. A. **Tobacco-growing in British Columbia and Canada.**—(Service des Tabacs. Rapport pour l'année 1910).—*Ministère Fédéral de l'Agriculture: Bulletin sur le tabac*, N. A—12, pp. 69. Ottawa, Avril 1911.

Canada

A recent bill has granted protection to Candian tobacco-leaf by levying a tax on foreign tobacco sufficient to guard the national product against competitors in the United States. The centres of

(1) In the second case the distance between the sides of the herring-bone is less than in the former.

production are: Quebec, where the Canelle, Connecticut Seed Leaf, Havana Seed Leaf and Comstock Spanish are cultivated; and South Ontario (Counties of Essex and Kent) where the Burley variety is specially grown. During recent years the tobacco harvest in South Ontario amounted to from 5 to 6 million pounds. In the latter district the climate is very mild and slow-growing varieties may be cultivated there. It is not rare to have a crop of about a ton to the acre. In British Columbia the climate is extremely mild and the soil is ferruginous. The varieties cultivated are Cuban, Havana Seed Leaf, Comstock Spanish and others.

At present Canada produces about 10 million pounds of tobacco annually. Three fifths of this are grown in Ontario and two fifths in Quebec. Chewing tobacco is specially produced from Burleys in Ontario. The black sorts for pipe-smoking are from the Grand Seed Leafs of Quebec and the best leaves of the Seed Leaf and Comstock. The new protection bill will have the effect of increasing the production of Canadian tobacco by a third, but it cannot be said that the trade is promising in the way of exportation, at least not for the near future. The present native production is only sufficient for a third of the consumption; the importation of the United States comprises chiefly cigars. Independently of the law by which the Canadian Government protects native production, there is a special department whose business it is to advise and assist planters in improving the quality of their products.

The centre of tobacco-planting in British Columbia is the valley of Okanagan, especially Kelowna. The year 1910 marks a great revival in tobacco planting in British Columbia. Two varieties are specially grown there: Cuban for the inside and Comstock Spanish for the outside of cigars. The maximum crop of 1909 was 50 000 lbs. This amount ought to be multiplied tenfold.

At the experimental farm at Ottawa, Comstock Spanish and Canelle were tested with a view to the production of seed; as well as those of Vérel and Montmélian imported from France for the production of pipe tobacco. In the province of Quebec there are two experimental stations: Saint-Jacques and Saint-Césaire. At the first of these experiments are made in crossing the following varieties:

Comstock × Sumatra
Comstock × Sumatra × Sumatra
Big Ohio × Sumatra.

In connection with these hybrids, experiments were made in seed-production, the preparation of beds, measures for exterminating

fungi and noxious insects in nurseries and hot-houses, and with oxalate of nicotine and Paris green as means of destroying the grey worm (*Agrotis segetum*) and wireworm (*Elater segetis*).

As regards the latter, the following results are noteworthy:

1. The action of oxalate of nicotine is beneficial especially if concentrated to $^1/_{125}$ and its effect is greater than that of Paris green.

2. Paris green in solution has no more effect than if applied as a top-dressing; in fact it does not kill either grey worms or wireworms when used in solution.

3. Oxalate does not kill but drives away these insects.

At the above-mentioned station, interesting experiments in manuring were made on five plots, with the Comstock Sumatra hybrid. The Big Ohio × Sumatra hybrid gave the best unit yield in the province of Quebec. At the Saint-Césaire station comparative studies are to be continued with the two hybrids Brewer Hybrid and Comstock × Sumatra. At the Harrow (South Essex, Ontario) testing station, experiments were made on 12 acres of Burley, Big Ohio, Connecticut Broad Leaf; and Virginia tobacco, dried by hot air (Warne variety). It is advisable not to replant Burley on the same soil under an interval of three years. In places where Burley is not a success, particularly as to colour, Broad Leaf and Big Ohio may by cultivated with advantage.

512 ROTHE, FERNANDO. **Coffee Cultivation in Costa Rica.** (Café-Kultur in Costa Rica). — *Revista Economica*, Num. 5, pp. 484-486. San José, Costa Rica, 1911.

Costa Rica

At the present time it is estimated that there are 35 000 ha. (87 000 ac.) under coffee in Costa Rica.

The export of coffee for the last few years has been as follows:

	kg.	tons.
1906	13 774 258	13 556
1907	17 325 531	17 051
1908	8 997 531	8 855
1909	12 030 104	11 840
1910	14 396 925	14 169

The amount of coffee consumed in the country is very large; it may be estimated at 10 % of that exported. One hectare yields on an average 423 kg. of coffee (per acre, 378 lbs.). Of the 35 000 ha., about 5 000 are cultivated intensively.

The cost of the coffee plantations on virgin soil is about 800 marks per ha. (£16 per acre). The expense can be reduced by a half if potatoes, beans or vegetables are grown between the trees. Cultural expenses are 100 to 160 marks per ha, (£2 to £3.4*s* per acre).

Firewood from the shelter trees fetches 8 to 14 marks per cub. m. (3*d* to 5*d* per cub. ft.).

The produce of small plantations is sold to the large proprietors who prepare it for export. The best coffee goes to England.

Trees from 5-10 years of age yield the heaviest crops. When the trees are above the latter age, the plantations must be replanted or recourse had to intensive cultivation.

In the interior there is an area of about 10 000 ha. (25 000 ac.), which is easily accessible and suitable for new plantations. In the Cordillera, about 25 or 30 km. (30 to 50 miles) from the railway, there are also 70 000 ha. (175 000 ac.) suitable for cultivation, *i.e.* about double the area at present under coffee.

FRUIT-GROWING.

KOBER, FRANZ. **The Oppenheim Method of tying up Vine Shoots.** (Die Oppenheimer Heftvorrichtung). *Allgemeine Weinzeitung*, 25. Jahrgang, No. 16, pp. 159-161; 26. Jahrgang, No. 16, pp. 163-164; 27. Jahrgang, No. 4, pp. 34-35. Wien, 21. April 1910, 20. April 1911 und 25. Januar 1912. **513**

Austria

The Viticultural School at Oppenheim, Hessen, has for some years made use of a labour-saving method for tying the young vine canes, which has been put to the test by the Author in Austrian public and private vineyards, and has been found thoroughly effective.

A brief description with drawings will make the construction of the trellis in question and the method of working clear. At both ends of each row of vines a wooden or better still an iron post (iron tube) is fitted upright in the ground. Between the two terminal posts, at distances of about 6 metres (19 ft. 6 in.), other wooden posts, about 10 cm. (4 in.) in diameter, are placed. The whole of the posts must project from 1.3-1.8 metres (4 to 7 ft.)

above the ground, according to the height to which the particular variety of Vine grows. The terminal posts are provided on two sides with 3 pairs of iron hooks; the first pair (A) is 30-40-50 cm. (12-16-20 in.) above the ground; the second pair (B) is about 30 cm. (12 in.) and the third (C) about 0.80-1 m. (31 to 39 in.) above the first. The intermediate posts are also equipped at corresponding heights with hooks or with 2 nails on both sides, but this is not absolutely essential. From the hooks on the end posts galvanised iron wires are stretched; the hooks or nails on the intermediate posts form points of support for these wires. The wires themselves should have a diameter of 2.5 mm. (about $^1/_{10}$ of an inch); they must be as long as the particular rows of vines. At their ends they carry small chains, which are suspended in the hooks on the posts and allow of tightening the wires to a lesser or greater extent. If the rows are more than 100 m. (109 yards) long, it is difficult to tighten the wires when only 2 terminal posts are used; for this reason very long vine rows are split up into 2 or more divisions, so that there are two terminal posts for a length of 50-100 m. (54 to 109 yards).

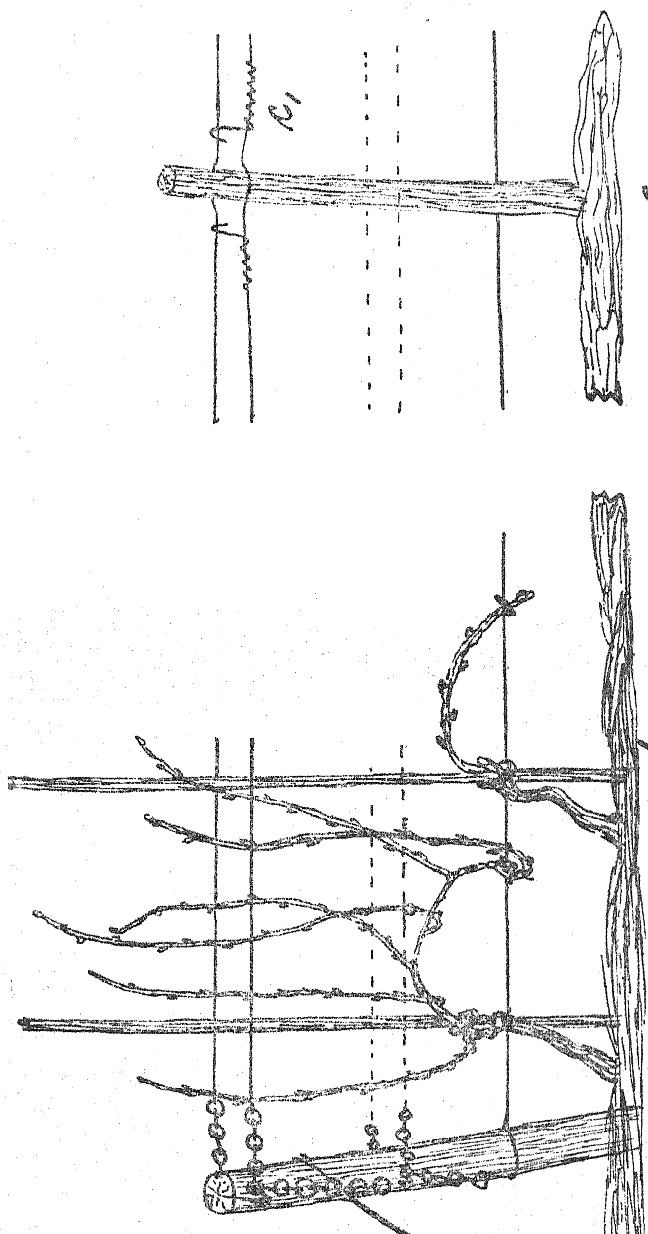
When the young vine shoots have got to a length of 15-20 cm. (6 to 8 in.), they are tied up for the first time; 2 wires are hung on to the bottom hooks of the terminal posts so that the young vine shoots are between two parallel wires (see Figures I and II).

Tying up on this method can be carried out by one man alone, but it is best done by three workmen together; two stand at the ends of the row and hang the wires in the hooks while the third one sees that when the wires are drawn up all the vine shoots are caught. After some time, when the young shoots have grown longer, a second pair of training wires are put in, but in the next higher hooks. For a third tying it will in most cases suffice to shift the wires from the middle hooks (B) into the top ones (C) (Fig. II).

To keep the wires together small wire hooks are fastened to them (Fig. I c.). In the first stage of the vine growth the hooks should not be joined up, or at any rate not all of them; the wires then move further apart and allow more space between them for the growth of the shoots. If one wire hook is closed up right and left of the intermediate posts, nails or hooks on the latter to carry the wire are not needed, and this gives the further advantage that the wires can be fastened to the posts at any height, provided that there are more than three pairs of hooks on the terminal posts.

In the winter the bottom wires are taken off and hung in the upper hooks. It is still better to place higher intermediate posts at distances of 15-20 m. (16 to 22 yards), provide them with hooks above and put the wires on the latter until they are once more used in the spring. The wires then form no obstacle to pruning and tillage.

As our illustrations show, the method can be applied to different modes of training ; *a* in both figures shows the stocks in the autumn, and *b* in the spring, after pruning ; *c* represents intermediate posts. The saving of labour by the use of the new method is considerable ; one workman at Oppenheim fastens up about 1 hectare (2.47 acres) per day on this method. In the Austrian experiments the cost of tying up was roughly 50-55 francs per hectare (16*s* to 16*s* 6*d* per acre), while tying with straw or bast involved an expenditure of five times this amount for the same area.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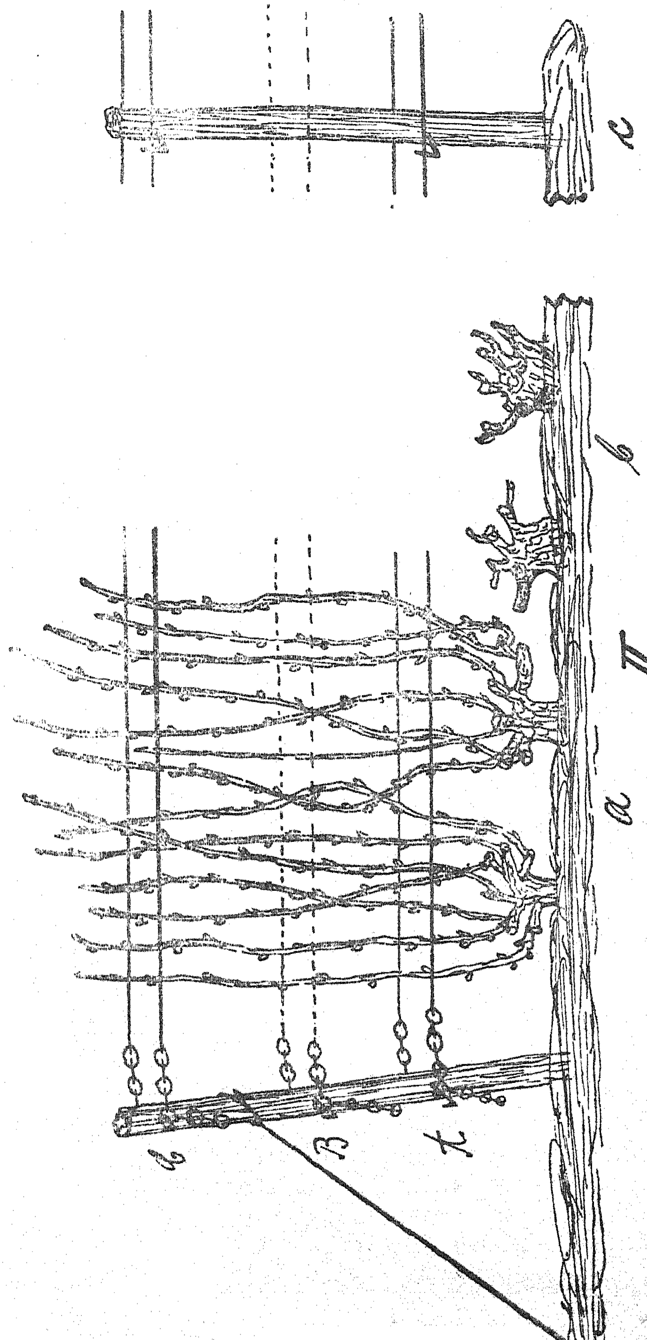
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514 RAVAZ, L. **Leaf-stripping of Vines.** (L'Effeuillage de la Vigne). — *Annales de l'Ecole Nationale d'agriculture de Montpellier*. Tome XI, Fasc. III, pp. 216-245. Montpellier, Janvier 1912.

France

The utility of stripping off the leaves of the vine has been called in question. It is argued that once we find that it is not a regular annual practice in a given vineyard, the explanation is that its utility is non-existent or even negative. If it be borne in mind, however, that owners do not make up their mind to undertake expensive tending operations unless they have found them to be effective, we must guard ourselves against condemning this practice *a priori*. Though it may not always be justified by experiment, the reason no doubt is that the experiments do not cover sufficient ground.

An experimental study of this question is for that matter no easy task. The removal of the leaves has the following consequences:

1. A better light supply to the grapes.
2. The elimination of shaded leaves, which may be hemi-parasites.
3. The reduction of the leaf surface of the plant, which in turn entails a reduction: (*a*) in transpiration; (*b*) in respiration; (*c*) in assimilation.
4. And finally, as the leaves removed may be varied both in number and age, according to the time or successive times at which the operation is carried out, it will be readily understood that its consequences are in turn very variable.

In order to be able to forecast the definite result, it is needful to investigate the bearing of each of these modifications on the conditions of vegetation.

Influence of better light supply on the ripening of the grapes.

Altough this is a very vexed question, it does seem that light exercises a greater influence than heat.

The Author shut up some clusters of Aramon and Pinot grapes in dark boxes some time after flowering. The boxes were white-washed outside or surrounded with a thick layer of moss so as to prevent a rise in temperature inside the box. A long blackened tube provided for air renewal, and a thermoneter enabled the variations of inside temperature to be followed,

The results were as follows:

Character of experiments	Weight of Bunches	Number of grapes	Weight of 1 grape	Acidity	Specific Gravity
	gm.		gm.	%	
Pinot enclosed in boxes . . .	116	102	1.14	4.0	1.0807
Control Pinot	348	300	1.16	4.0	1.1097
Aramon enclosed in boxes:					
No. 1	112	73	1.53	6.3	1.0323
No. 2	138	98	1.40	6.1	1.0363
No. 3	46	29	1.58	3.9	1.0503
No. 4	29	17	1.64	5.6	1.0328
Control Aramon	37	75	3.16	4.8	1.0528

In the dark the grapes ripen and colour, and the Pinot seems to require less light than the Aramon. It is likewise an earlier variety. The want of light does not prevent the ripening and colouring of the grapes, but retards it, and the retardation is more marked in proportion as the varieties of vines are later maturing or cultivated in more northerly regions.

For that matter, facts of ordinary observation likewise prove the results of these experiments to be well grounded. The grapes begin to ripen and colour on the side exposed to the sun; those inside the bunches likewise ripen, but later than those outside.

Influence of air temperature on the flowering of the vine.

It is exceedingly important that the temperature should be high at the time of flowering· In low temperature, flowering in the open vineyard is indefinitely prolonged and ends badly: those are the years when the fruits drop and wither. In high temperatures on the contrary it is very rapid; these are the good fruiting years; of course always referring to a temperate climate.

Influence of the temperature of the air on the ripening of the grape.

A Picquepoul vine was grown under glass until after flowering. When the grapes were well formed it was carried outside and placed against the glass; one bunch, the highest on a branch carrying two, was placed inside the hothouse, the other remained outside, together with all the other bunches of the vine and all its leaves. The inside bunch was consequently under the same conditions of feeding and light as the outside bunches; it was only in a hotter

atmosphere, as is shown by the records of the registering thermometers.

Results: The outside bunches continued to grow, but very slowly. The inside one put on size more rapidly, coloured early and ripened. The difference in the size of the grapes and sugar contents is indicated in the following table:

	Total wight gm.	No. of grapes	Weight of grapes gm.	Weight of 1 grape: gm.	Sugar: per 1000	Acidity: as H_2SO_4 per 1000
Inside Bunch . . .	43.0	42	40.0	0.952	117.5	7.025
Outside Bunch. . .	17.2	54	13.8	0.205	18.24	20.652

Thus, even when the outside conditions are highly unfavourable to the function of the leaves, the grapes can ripen if they enjoy a sufficiently high temperature. It will be seen how great is the direct influence of the temperature on the ripening of the grapes.

Influence of the removal of shaded leaves.

The removal of shaded leaves is evidently of advantage in northern regions; they must frequently expend more than they produce; whilst it may even be injurious in countries enjoying much sunlight.

Reduction of transpiration. The reduction of transpiration is rather injurious in wet countries and useful in dry countries.

Reduction of assimilation. The leaves removed are always the oldest and, according to Macagno and Cuboni, the leaves at the base of the vine shoots assimilate less than leaves recently full grown. This is also the opinion of Audoynaud, and these three Authors concur in saying that on the whole the removal of the leaves at the base of the shoots can only be harmless or useful in our regions.

M. Müntz is opposed to the practice of leaf-stripping.

Confronted with these divergencies of opinion, the Author took up the study of the question again and arrived at the following conclusions:

Leaf-stripping is sometimes injurious, sometimes indifferent, sometimes useful.

1. A continuous stripping of the leaves by which the vine is constantly deprived of its leaves in proportion as its shoots grow, results in the death of the stock before the grapes have ripened.

2. Complete leaf-stripping carried out when growth has stopped is manifested by retardation of ripening and reduction of the sugar contents.

3. If ordinary leaf-stripping is adhered to, consisting in the removal of 5 to 10 leaves from the base of the branches (the latter may have more than thirty, besides those of the side shoots), it is seen to have been injurious to the following:

To a vigorous Folle blanche trained on iron wire.

To robust Grenaches, trained on iron wire.

To Aramons, vigorous and spreading their shoots freely on the ground.

It left the bent Pinots almost entirely unaffected.

It was very useful: 1) for feeble erect Pinots; 2) for feeble erect Grenaches; 3) for the Gamay, likewise feeble and erect.

Keeping to these features, the efficacy of leaf-stripp ng would seem to be bound up with the direction of the branches and the duration of growth. Weak vines which early cease growing, vines of erect habit, either in consequence of their feebleness or owing to their nature, or owing to the stake, are therefore those likely to benefit most.

Vigorous vines of prolonged growth or with bent shoots trained on iron wire derive less benefit or even suffer.

This diversity in the results of the operation will perhaps be explained if it be remembered:

1, that the elimination of the leaves, even the leaves at the base, reduces the assimilation surface: " injurious effect "; 2, that the exposure of the grape bunches to the sun promotes their ripening: " useful effect ".

But in order that the latter should outweigh the former, the other centres of attraction, such as the growing tips and the side shoots, must not change the direction of travel of the cell contents; neither must blockings, such as annular incisions, bends, etc., slow down the rate of movement towards the grapes. Vigorous vines however remain in growth for a long time, and vines trained on iron wire or without stakes have more or less bent branches.

Under ordinary conditions, stripping is rather beneficial than injurious to the quality of the products. It is therefore a practice highly to be recommended for obtaining high quality wines.

POPENOE, F. W. **The Mango in Southern California.** — *Pomona Journal of Economic Botany*, Vol. I. No. 4, pp. 153-200. Claremont, December 1911. **515**

United States: California

The cultivation of the mango, which is so remunerative a fruit, is still little known in California. The few trees hitherto introduced have yielded poor results owing, doubtless, to the small amount of

care devoted to them. The mango behaves differently according to the locality in which it is grown. It is more suited to the hot interior valleys, where it is sheltered from winds and frosts, than to the sea-coast, owing to the lack of sufficient heat near the ocean during the summer months for the proper ripening of the fruit.

It seems reasonable to believe that the valleys of San Joaquin, Imperial and Coachella will produce first class mangos.

But the varieties which have been grown here, so far, have no special value, and offer no point of departure for selection, which in any case, is a process requiring so much time, that it is best to graft upon them the best Indian varieties. The most successful method is inarching.

The necessary work connected with selection, acclimatization, and cultural experiments has been started by the Department of Agriculture; a series of inarched trees, comprising about forty of the choicest varieties from India and other countries, have been sent to several locations in S. California for trial.

The list includes, Alphonse, Ameeri, Amini, Bhadauria, Bhurdas, Bombay yellow, Brindabani, Bulbulchasm, Cambodiana, Caraboa, Chickna, Davey's Favourite, Divine, Ennuria, Faizan, Fernandez, Itamaraca, Jamshedi, Julie, Kachmahua, Kistapal, Langra, Langra Hardoi, Langra Large, Malda, Maller, Mulgoba, Mullgoa, Paheri, Punia, Rajabury, Salamar, Sharbati Black, Singapur, Stalkart, Sufaida, Surkha, Totapari and White Alphonse.

The results of many experiments by Prof. Rolf seem to indicate beyond the possibility of a doubt, that the question of stock is of the utmost importance, as in the case of the mango the stock behaves differently according to the scion chosen.

Thus it is important to determine not only those Indian varieties which are most adopted to the climate and soil of California, but also to find out those local acclimatized varieties which will serve as the best stocks for them.

The writer gives a detailed botanico-agronomical description of the different indigenous varieties: Sierra Madre, Fales, Santa Ana, Red Number Eleven; and concludes with a long list of the most common varieties of mangos.

516 **Cocoa-Growing on the Gold Coast.** (Die Kakaokultur an der Goldküste). — *Der Tropenpflanzer*, No. 1, pp. 39-44. Berlin, Januar 1912.

The Gold Coast presents an almost unique example in Colonial development. During a period of 10 years this country has deve-

Gold Coast loped the cultivation of cocoa to such good effect that it speedily

reached and has perhaps surpassed that of San Tomé. The Gold Coast, in 1910, exported 460 000 sacks of cocoa representing 23 000 tons, while even the Cameroons, from 1898 to the end of 1910, only exported 85 000 sacks, representing 4 000 tons. On the Gold Coast, cocoa-growing is a strictly native cultivation. The largest plantations do not exceed 30 acres; each acre has about 600 plants. The districts where cocoa grows are about 28 to 30 miles from the coast. The construction of the railway traversing the plantation region has been extremely influential in the sense of developing this crop.

Plantations yield fruit when 6 to 12 years old. The natives procure a crop of about 6 ½ lb. of dry cocoa per tree, while in the experimental Garden of Aburi from 8 ½ to 11 lb. have been obtained. The Government has entrusted three Europeans and eleven natives with the supervision of the cultivation and instruction of the natives.

The production will continue to increase, because a number of plantations are not yet old enough to produce. Cocoa growing has been a veritable source of wealth to the Colony, the more so as it provides occupation for at least 10 per cent of the entire population.

FORESTRY.

The Preparation of Forest Maps and their Practical Importance. 517

1. GLASER, THEODOR. Die Herstellung forstlicher Bestands-übersichts- und Wirtschaftskarten. — *Forstwissenschaftliches Central Blatt*, LVI. J., H. 1., pp. 10-27. Berlin, Januar 1912.
2. WALTHER, F. Zur Frage der Vervielfältigung forstlicher Bestandeskarten. — *Ibidem*, LV. J., H. 6., pp. 334-341. Berlin, Juni 1911.
3. Anleitung zur Standorts- und Bestandesbeschreibung beim forstlichen Versuchswesen. (*Nach dem Beschlusse des Vereines deutscher forstlicher Versuchsanstalten vom 3. September 1908*). Zw. Aufl., pp. 33. Neudamm, 1911.
4. LOVAT AND STIRLING OF KEIR, LORD. Afforestation in Scotland, Forest Survey of Glen Mor, and a Consideration of Certain Problems arising therefrom, 1911 — *Transactions of the Royal Scottish Arboricultural Society*, Vol. XXV, pp. 91 + pl. 1 + Maps 3. Edinburgh, 1911.

Amongst the instructions referring to forest-management, which have lately been published by the Afforestation Departments of the **Germany**

German States, besides those of Saxony (1), which are very detailed, the publications of the Bavarian Government (2) may be regarded as models.

It is sufficient for our purposes to set forth the different aims of forestry, which are as follows:

1. To give a comprehensive representation of all the present economic conditions which have to do with forest exploitation.

2. To determine on this basis, with due regard to the economic ends served by the forest, the best economic rules to follow.

3. To draw up plans for the immediate regulation of the forest exploitation in question.

4. To ensure that the above shall be carried out, and to provide for future development.

The first of the aims ment oned is attained by means of descriptive forest maps, which also show the methods of management; for the preparation of these, the data collected under 1 and 2 will be useful.

These maps, in order to possess real practical value, must in the first place meet the following requirements:

a) Give, as accurately as possible, the topographical conditions.

b) Supply as accurate a representation as possible of the forest and economic conditions, and for this reason, the maps must not be on too small a scale.

c) Combine the information into a clear and comprehensive whole.

d) The execution of the maps should be relatively simple, in order that they can be reproduced quickly and cheaply. They should also be as resistant as possible to light and weather.

With reference to point *a*), the hydrographic conditions should be shown in blue, the courses of the rivers, which are important from the forestry point of view, can also be indicated by the same colour.

Contours are also of very great importance from the standpoint of afforestation and exploitation and should never be omitted;

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(1) Geschäftsordnung für die Kgl. sächsische Staatsforstverwaltung, einschl. d. Forsteinrichtungsanstalt & Forstakademie, 2. Bd. Forsteinrichtung u. Betrieb, pp. 165. Dresden, 1911.

(2) Anweisung für die Forsteinrichtung in den K. B. Staatswaldungen. — *Mitteilungen aus der Staatsforstverwaltung Bayerns*, H. 11, pp. 142 + C. e form. 33. München, 1910.

they should be marked every 10 metres (32 ft. 10 in.). The conditions of viability have also a special interest; these cannot be indicated by maps on the scale of 1 to 20 000. Further, for technical purposes, the different types of transport must be shown, and for administrative reasons, the public and private roads must be indicated.

With regard to point *b*), it is advisable to employ a scale of 1 to 10 000 or 1 to 12 500.

Under heading *c*) the chief importance is given to the species of trees and their classification according to age.

For this purpose, numerous methods exist and they may be divided into three groups.

I. Species of trees indicated by colour, classes by shades; advantages, clear and looks well. Disadvantages, application limited, difficulty of reproduction.

II. Species of trees in colour, classes in hatching; advantages, rapidity of execution, clear definition of classes, facility of reproduction. Disadvantages, want of clearness, and unaesthetic appearance.

III. Trees represented by abbreviations and symbolic signs, classes in colour; advantages, facility of preparation. Disadvantages, slight difficulty in reproduction, want of clearness.

The writer of article 1, basing his remarks on the researches of Sinner (1) recommends the following system of reproduction:

1) The species of forest trees should, as far as possible, be represented by the same colours throughout, and graphic signs, and the initials of their common names should be employed in the case of secondary trees in mixed woods.

2) Ground not covered by forest should be left uncoloured; the usual topographical signs can be used for other formations, fields, meadows, etc.

3) Classification according to age will be confined to the principal divisions, three for example, represented in light and shade, and the sub-classes by alphabetical letters, adopting Roman numerals for the classification of the ground, and placing them above or below the line according as it is wished to indicate the first or second half of these sub-classes. The ground classes of I to V are subdivided under the Arab numerals 1-4. The stand classes are

(1) *Mitteilungen des Vereins bayerischer Staatsforstverwaltungsbeamter*, V. J., 3-4 H. 1909.

taken as tenths of the maximum of the whole, and are indicated by the Arab numerals 1 to 9 which must be pointed off.

Example : $a^{\mathrm{II}\ 3.7}$, $b_{\mathrm{I}\ 2.9}$.

4) The series of the sections can be indicated by arrows.

5) Secondary felling, clearing, etc. is shown by red lines.

6) Exploitation felling should only be indicated when so doing does not impair the clearness of the map.

7) Kind of wood. —

High-forest.

Natural regeneration:

a) selection plan, white dots in the regeneration areas;

b) successive felling, small white circles;

c) strip felling, white lines with small commas between them;

d) combination, all the preceding signs used together.

Artificial Regeneration — clear felling, hatching in white lines.

Coppice, with a special colour and with light and shade.

Coppice-with-standards. Coppice and standards each indicated by the above signs.

With regard to *d*) the reproduction of the maps, it is necessary to remember, that the original maps or lithographs should contain all the essentials given under head *a*). The indications coming under *c*) can be added by hand from time to time, as required.

The process of reproduction, in short, should be inexpensive, and not injure the outline and the paper. The colours should be good and lasting. It is well to use fixatives and also celluloid covers.

For further information on the subject with a view to experiments in forestry, besides the works quoted by the writer of article I, especially from the standpoint of map-making, reference can be made to the guide to the description of the forest stations and plantations published by the Union of German Stations of Experimental Forestry quoted above as No. 3, and to which a model form is added.

As regards reafforestation, the survey made for the Royal Scottish Arboricultural Society quoted as No. 4. at the head of this paper, is of great practical interest at the present time. This work was undertaken to serve as the model of a general survey of Great Britain, with the aim of determining the amount of existing forest, and especially the areas which would repay reafforestation. It may be useful to note the methods followed in the work.

1) Detailed survey of the ground with reference to its suitability for sylviculture.

2) Complete analysis of existing economic factors and of the modification in these which reafforestation will entail.

3) Extension of area of afforestation, with due regard to the two previous points.

4) Plan of the areas to be acquired by the Forestry Department, to be rented by the Department, to be replanted in cooperation with the owners of the property, to be planted by the owners with the assistance of an advance from the Government, to be replanted by the owner at his own expense and subject to inspection.

5) Necessary preliminaries to afforestation: central place for nursery, sawyard, etc.; dwellings for workmen; compensation for sheep pastures, woods and ground used for shooting; indemnities; acquisition and care of existing woods; future utilization of timber.

The survey is limited to a zone containing, besides some woods, an area of 60 000 acres suitable for reafforestation. Three forestry maps are given, one contains general topographical data, and shows existing forests, the second shows the areas suitable for replanting, the trees being indicated by different colours (red: larch; blue: spruce, common and Sitka; green: Scotch pine). The third, like the second, gives the subdivisions in three shades showing the ages of the plantation, from 1 to 15 years, 15 to 30 years, 30 to 40 years.

Some Recent Results of Forest Economy in England. **518**

SLATER, ALEXANDER. Growing Larch for Profit. — *Quarterly Journal of Forestry*. Vol. VI, No. 1, pp. 1-11 + figg. 2. London, Jan. 1912.

ACKERS, C. P. A Successful Example of Open Planting. — *Ibidem*, pp. 20-22.

PRATT, E. R. Estate Economy, No. III — Tree Guards. — *Ibidem*, pp. 11-13 + figg. 1.

United Kingdom: England

It is stated in the first of these articles, that since the larch has been introduced into England, now about two centuries, no other species can compete with it from an economic point of view, especially when it has been planted on soils and in situations which are adapted to its well-being and well cared for between the ages of 10 and 30 years, the critical period for larch plantations. The writer recommends sandy or light loamy soils, and an altitude of 600 to 700 ft.; he considers the Tyrolese variety the best. The Japanese larch is the more suitable kind on the heavier and damper soils. Lastly he advises plantations without admixture of other trees.

The following table, which gives the cost and expenses of a plantation of 24 acres made in 1890 upon a sandy loam soil at an altitude of 160 to 210 ft., and originally planted at 4 ft. apart:

Expenditure	Per acre £ s d
Cost of planting, including trees	7 10 0
Replanting trees and clearing for 2 years	0 16 6
Management expenses	2 14 0
Total . . .	11 0 6

Receipts	Per acre £ s d
By thinnings 1900	91 12 6
" " 1905	146 8 0
" " 1906-1911	74 0 0
Total receipts . . .	312 0 6

When the land was taken over for planting, it had been used as a sheep-run. The annual value of the land for agricultural purposes was about 6*s* per acre; the shooting rights are let, but the receipts from this source do not cover the rates and taxes.

An estimate of the present crop and volume of timber, gives 1014 trees per acre with a volume of 2408 cubic ft. According to the present rate of growth, there should be a final crop of 800 trees containing 4 800 cub. ft. per acre, at the age of 45 years.

The present price of larch poles is 8*d* to 10*d* per cubic ft.

The second article gives no less interesting data concerning the thinning of a mixed plantation of larch and sweet chestnut. The plantation was only six acres in extent, and consisted of alternate rows of larch and chestnut, planted 6 ft. by 6 ft.; the age of the trees was 40-42 years. The soil was heavy loam, the exposure north, but very sheltered; the ground had not been previously planted with timber.

The value of the thinnings was as follows:

	£ s d
372 larch containing 4 239 ½ cubic feet .	168 16 0
136 chestnut containing 892 cubic feet . .	35 19 0
Poles, sundries and small lots	30 11 8
Total . . .	235 6 8

Less :

Cost of felling, transport etc.	22 10 10
	£212 15 10

There remained on the 4 ½ acres, when the thinning was over, a nearly pure larch wood containing 520 trees averaging 15 ft. per tree, value at 10*d*, £325, or per acre £72-4-8 : or a fair value for the whole crop of £120 per acre.

Such a plantation should be established at the cost of £6 per acre, which compounded together with an acre rate of 5*s* in the £ yearly, after 42 years, at 3 %, brings a debit of £25 per acre.

The protection of trees planted in park or pasture lands against cattle is a subject of some importance. The Royal English Arboricultural Society gave special medals for tree guards at its recen exhibition at Norwich.

In Class 8 it was defined that the tree-guard should :

(1) Combine protection from stock and vermin.
(2) Be efficient and economical.
(3) Allow access for pruning and cleaning.

The cost of guarding each tree should not exceed four shillings, in addition to one shilling for planting. If this amount is exceeded, forestry ends and landscape gardening begins. For instance 50 trees planted on one acre, at 10 yards apart, would cost £12 10*s*. An acre enclosed and planted in the usual way would cost about the same, the profits on the thinnings being equal to the value of the herbage between the guarded trees.

The writer describes an economical type of guard used since 1908; it is 7 ft. high, as a special protection against young horses, though 6 ft. is, as a rule, high enough. Three creosoted larch poles are fixed by a creosoted poplar triangle. The three scantlings are fixed to the top of the poles by French nails. Barbed wire is also wound round and stapled to the battens.

The cost of these guards is 2*s*. 10*d* each.

CAJANDER, A. K. **Forest Types on Moor Soil.** (Kangasmetsistä turvemaalla. Esitelmä, jonka piti Metsätieteellisen seuran Kokouk sessa maraskuun 20 p : nä 1911). — *Suomen Metsänhoitoyhdistyksen Julkaisuja*, XXVIII, IV, V. 11, pp. 694-699. **519**

The Author considers the forest types of Southern and Central Finland : **Finland**

1. Fern type		I principal type.
2. *Oxalis* »		
3. *Myrtillus* »		II principal type.
4. *Vaccinium* »		
5. *Calluna* »		III principal type.

Types 2-5 were found not only on ordinary mineral soil but also on moor soil of a thickness of 1.15 m. (3 ft. 8 in.) to 4 m. (13 ft.) and more. Consequently as the mineral soil examined included the descriptions sandy, loamy, clayey and detrital, it would seem to be proved that the forest types in question are to some extent independent of the petrographical and geological nature of the soil when the other conditions of vegetable life are nearly equal.

Consequently, the origin of these forest types in moor soil is due to the easy outflow of the excess of water taking place on the boundaries of the peat bed, so that these peat moors can be regarded as possessing a kind of natural drainage. Here this conclusion may be drawn, very important from the practical point of view, that if peat lands are artificially drained they can be gradually transformed into normal forest stands. The problem then arises of determining the type of forest into which a given type of peat moor can be transformed by means of drainage, taking account of the essential factor — the energy of growth — which differs to a noticeable extent according to the forest type

520 KUBELKA, AUGUST. **The Intensive Cultivation of High Mountain Forests.** — *Die intensive Bewirtschaftung der Hochgebirgsforste. Voraussetzungen in Bezug auf Bringungswesen, Betriebseinrichtung und Wirtschaftsformen*, pp. V + 86. Wien, 1912.

Germany

The writer shows that it is an absolute necessity for every forest owner, especially if his property consists of high mountain forests, to adopt the most intensive cultivation possible.

One of the first steps to take in this direction, is the establishment of efficacious, modern and powerful means of transport, without which forest exploitation in the high mountains is impossible, and which is absolutely necessary on account of the high price of timber.

This is the first and most important point which the owner should attend to in his own interests. Next comes the question of the local management of the forest which increases the productivity of the soil by obtaining a good yield of timber, which shall

be regularly felled. It is only by such a local management that it is possible for the forester to take the necessary measures to ensure the highest yield of which the soil is capable, and a maximum and sustained volume of timber.

The sooner the owner resolves to adopt more modern methods in mountain forests, the sooner will his efforts be crowned with success, and his invested capital bring him in high returns.

It is not necessary that he should at once give all the capital which will be required; this will be provided by the forest itself, at least in those districts where there is a rich supply of mature wood. By employing this capital in the organization of the means of transport, it can at once be reimbursed by having recourse to the supplies of mature wood, this proceeding appearing to be completely justified economically.

Care must however be taken that forest improvement considerations do not come into conflict with such measures as have for their aim the preservation and increase of the soil fertility; in other words a distinction must be drawn between the chronometric and local measures, striving to carry out both according to the principles of Prof. Wagner. (1)

To sum up: it is necessary to regard the sections as independent economic units, and to reduce excessively long rotation intervals to those of a more suitable duration, employing differential treatment with due regard to the condition of the soil and of the various trees.

In this manner, forest management is refounded on more natural and simple principles; natural reproduction is made use of in those parts of the forest where abundant seed is produced, and artificial measures are employed where they appear necessary. The result is mixed plantations with natural differentiation in place of pure stands.

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(1) *Die Grundlagen der räumlichen Ordnung im Walde.* Tübingen, 1907. (Zweite verm. u. verb. Aufl. Tübingen, 1911).

The forest management scheme proposed by Prof. WAGNER consists essentially in giving preference to natural reproduction, in so far as it gives rise to trees suitable to the locality and to mixed plantations.

The course to pursue to attain this aim, would be to fell the forest in strips from east to west beginning on the north side; a clearing should first be made to give a start to natural reproduction. In theory there would be, in the end, beginning from the north side, a threefold series: (*a*) clearing, (*b*) natural regeneration with shelter, (*c*) complete stand of young trees. Artificial reproduction is only resorted to as a supplementary measure. (*Ed.*).

of spruce, for instance, which being artificial, are therefore not calculated to produce a fruitful and sustained forest yield.

Clear-felling large areas is a practice which will fall into disuse, for in the case of high mountains, this system is economically a mistake, for on the one hand, it entails great expense in replanting and, on the other, it causes great loss in increment. As a proof of this, the writer cites a characteristic example: —

Situation: 75 hectares (185 acres) on good soil on south-west slopes of high mountain.

Area and Contents: 800 cub. m. of wood 120 years old per ha. (11 400 cub. ft. per ac.).

Treatment: Clear-felling begun 40 years ago, and completed at the end of ten years.

Cultivation expenses: planting and filling up gaps . .	£. 1 875
Loss in yearly increment	» 3 750
Total debit . . .	£ 5 625

Debit about £30 per acre.

With the selection system and natural regeneration with shelter, it would have been possible to make a natural plantation 30 years old.

521 LINDHOLM, WALTER. **Number and Average Distance of Standing Trees.** (Runkojen lukumäärä ja Keskivälimatka). — *Suomen Metsänhoitoyhdistyksen Julkaisuja*, XXVIII No., Vol. 11, pp. 700-704 + fgs. 4.

Finland

The Author sets himself to solve the following problem which is of very great practical interest: How should the average distance between the trees in a wood be calculated, given the area and the number of trees?

Assuming an ideal wood, in which all trees are equidistant, the Author concludes that the average distance between the trees corresponds to the shortest diagonals of the areas of incidence, *i. e.* of the vertical shadow of the trees, when these areas are represented by a rhomboidal or a hexagonal system.

In both cases the interval may be calculated by means of the following formula:

$$d = \frac{107 \cdot 457 \ldots}{\sqrt{n}}$$

in which d is the average distance and n the number of trees per

hectare. By the aid of this formula the Author prepared a table which is appended to the text.

It must further be noted that as compared with the interval thus calculated, that regarded as a side of the square equivalent to the area of incidence is too small, according to Pressler, while the diameter of a circular area of incidence is too large.

The Author refers to the difficulty met with in the practical use of the coefficient of interval, *i. e.* the ratio between the interval and the normal diameter of the trunks of trees, especially in the estimate made according to Bretschneider and others. This becomes of great importance in consequence of the fact that the average diameter is calculated from the average of test areas, and not directly as the average of the different diameters; for this reason the points of departure of the estimate prove to be the average interval and the average area of incidence. Furthermore, by using the interval coefficient obtained by direct arithmetical calculation, errors are also made, the magnitude of which depends on the divergence of the extreme values in comparison with the average, this divergence being greater in proportion as the shape of the wood is more irregular.

LIVE-STOCK AND BREEDING

ANATOMY AND PHYSIOLOGY.

MALSBURG, Prof. Dr. Karl von der. **Size of Cell as a Factor in Shape and Productiveness of Farm animals.** (Die Zellengrösse als Form-und Leistungsfaktor bei den landwirtschaftlichen Nutztieren). — *15. Flugschrift der Deutschen Gesellschaft für Züchtungskunde.* Hannover, 1911. 522

Germany

The endeavour in modern zoology to trace biological questions of breeding back to their ultimate causes, and the references of

(1) Published in No. 10 of the *Arbeiten der Deutschen Gesellschaft für Züchtungskunde.*

prominent men in this branch to a diversity in the constitution and finer bodily structure of different animals, prompted the author to enter upon a thorough investigation (1) as to the essential nature of these differences. As the subject of his enquiries he chose the smallest units of the animal body, namely the cells.

He found that the size of a cell stands in a close relation to the vital processes of which it is the seat and that consequently the size of the cell forms an expression and an objectively tangible (microscopic) distinctive feature of its biological character, *i.e.* its individual peculiarities. The fact that a cell expands in three directions is conditioned by its function; it cannot, however, exceed a certain size without at the same time unfavourably affecting its life conditions. When a body grows in size, its surface increases by the square or second power, but its volume by the third power. Now the cell has nothing but its surface as the gate of entrance for nutrition and oxygen and as the exit for the products of metabolism. This gateway therefore grows smaller in relation to the bulk, in proportion as the latter increases. It is for this reason that the smallest cells show the highest vital power. This smallness is sought to be permanently secured by the cells beginning to split up as soon as they have reached a certain size. Cell division is therefore an inner necessity arising out of growth, a fact already pointed out by other enquirers.

If the plasm of a cell takes up too much water of imbibition (the water surrounding each molecule) the molecules are forced further apart by the thicker water layers lying between them, and this reduces their action on each other and also the action on them of external influences. Therefore metabolism will proceed but slowly and the consumption of food-materials and elimination of metabolic products will fall off. A cell thus reduced in activity will not be compelled to split up so soon because its smaller exchange of materials can still continue when the ratio of the volume to the surface has become less favourable. Such a large coarse cell will also assimilate a great deal, because its larger contents of water facilitate solution of the food-materials supplied; and, consuming little as mentioned above, it will grow rapidly, but on the other hand will possess less vital energy: this is the property shown by the cells of early maturing animals.

There may also be a third class of cells in which the cell plasm is enfeebled from the out-set by some circumstance and therefore works defectively. To enable the cell to work at all, however, it must be very favourably constructed, *i.e.* as small and tender as possible. Of all kinds of cells this is the lowest in value.

If we now regard the organism as the outcome of its constituent parts, *i.e.* its cells, we can divide them into three classes:

1. Fine celled.
2. Coarse celled.
3. Tender celled.

The result of these theoretical considerations finds confirmation in nature. As far back as the forties of last century Sir William Bowman had drawn up the following scale of the average sizes of cells for the animals in the 5 classes of vertebrates:

Fish	122	mikrons
Amphibia. . .	68	»
Reptiles . . .	54	»
Mammals. . .	44	»
Birds	34	»

This is a striking coincidence, but no chance one, between the intensity of the vital processes, the entire essential nature of the animals and the size of cell.

The American biologist, F. W. Conklin, in his work " The Cell Size and the Body Size " points out that the cell size conditions the body size of the animal within a species and that the differences between large and small animals of the same species are conditioned by the different sizes of their body cells.

Farming practice also allows for the difference in metabolism in large and small animals. Kellner established for oxen a higher starch value as the normal per 1 000 kg. of live weight in proportion as the animals are younger, *i.e.* smaller.

FEEDS AND FEEDING.

SCHNEIDER, KARL. **Is Winter Pasture possible and advantageous in Germany?** (Ist Winterweide möglich und vorteilhaft?). — *Deutsche landwirtschaftliche Tierzucht*, 16. Jahrgang, Nr. 4., pp. 41-42. Hannover, 26. Januar 1912. **528**

Germany

Most breeders think it impossible to turn out cattle to graze during the winter under German climatic conditions. Ten years ago

(1) Situated in the Westerwald where the climate is very severe. (*Ed.*).

the Author was still of the same opinion, but now winter grazing plays a considerable part on his farm (1). Not only foals but horned cattle, including cows out of milk and in calf, may be put out to graze during the day throughout the winter. These animals have a simple airy shed for their night quarters; in the morning the doors are opened and the animals immediately get out to the pasture land adjoining the shed; neither snow nor cold keeps them in the shed. This shows that they feel at their ease on the meadow, because they could return to the byre if they did not care to stay out.

The benefit of this process is two-fold:

1. The animals are thoroughly hardened and get a thick wooly coat, which protects them far more efficiently against cold and rain than the coat of the animals kept in the cattle shed during the winter. When the latter in the spring go out to pasture, they suffer from the cold, are soaked through to the skin in rainy weather and consequently lose weight during the first grazing period. The Author secures from ¼ hectare (0.6 acre) of good pasturage, during the summer, from 100 to 125 kilogrammes (220 to 275 lb.) gain in live weight in the case of 1 year old cattle or foals, 150 to 175 kg. (330 to 385 lb.) live weight increase in 2 year old cattle or 1 000 litres (220 gals.) of milk in cows. Comparative trials with animals kept in the shed during the winter and others let out on to pasture during winter, proved that the above gain in live weight is only attainable with the latter, as there is no arrest of growth in the spring.

2. Winter pasturing however not merely hardens the animals but supplies them with food. The Author manures his meadows in July and August with superphosphate and sulphate of ammonia and as a result a luxuriant growth of forage plants takes place in autumn; the animals then find their food outside until snow falls. Trial weighings showed that without any additional feeding in the house, from the 15th November to the 20th December 1911 there was still secured an average gain of weight of 10 kg. (22 lb.) per head.

The Author emphasizes the fact that winter pasturage is only possible when the pasture land is of sufficient area. Too many animals kept on the same area would break up the greensward too much and impair the growth of forage in the following year. He regards the sowing of spring rye (Johannisroggen) and winter barley on suitable soil as advisable for providing winter pasturage.

It should also be mentioned that calves on the farm we are dealing with are roughly reared; in the summer they live in a calf yard, where shelter is only offered by a board roof and a tree, and they pass the winter in a cool shed.

WAKERLEY, F. **The Feeding of Dairy Cows in 1911. Linseed Cake versus Soya Bean Meal.** — *Reports on Experiments with Crops and Stock in the Year 1910-1911*, pp 57-66. Midland Agric. and Dairy College, Kingston-on-Soar. **524**

England

Soya bean meal is a residual bye-product resulting from the extraction of oil from soya beans, and it is placed on the market at what appears to be, from the analysis, a comparatively low price.

With the exception of the oil, it differs little from Soya bean cake and as the oil in the cake, when fed to cows, has been accused of influencing the dairy products, the experiment was undertaken with a view to finding out whether any ill effects were noticeable when the substance used was deprived of most of its oily ingredients.

The Object of the Experiment.

1) To contrast the bye-product Soya bean meal with linseed cake in a mixed ration for cows, taking note of its suitability for milk production.

2) By comparing the market price of the two foods of equal nutrients, to see which is the cheaper source of concentrated food.

3) To determine the relative effects of the foods on quality of milk, as determined by Gerber (fat percentage), and butter, as derived from the churning of a representative sample of cream.

The animals were selected and placed on preliminary feeding on Jan. 22nd and continued to receive a mixed ration in which 5 lbs. undecorticated cotton cake constituted the main concentrated food for one week. At the end of this time, the cows were finally divided into two lots and weighed; feeding proper commenced on Jan. 29th and they continued under treatment for one month, *i.e.* each lot of four cows received the experimental foods for two weeks respectively.

The cows were divided into two lots of four each, the lots being balanced as nearly as possible in weight, milk yield and period of lactation.

The cows were cross-bred Shorthorns, some of which were reared on the farm and are representative of the type of cow kept in the College herd.

Their live weight ranged from 10-11 cwt. Weighings were taken on Jan. 30th when the experiments commenced; at the end of a fortnight, Feb. 13th, when alteration was made in the feeding; and again at the end of the experiment on Feb. 27th.

Rations per Day.

5 lbs Undecorticated cotton cake, or 4 ½ lbs. linseed cake, or 4 1/8 lbs. Soya bean meal.

2 lbs. Mixed meal (bran, sharps, dried grain).

14 lbs. Hay.

7 lbs. Straw chop.

56 lbs. Mangels (a part whole) pulped and given with chop and meal.

Summary.

1) Both linseed cake and Soya bean meal gave good results when fed in mixed ration to cows.

2) Linseed cake gave a slight advantage in milk yield and live weight.

3) The manurial residue is higher from Soya bean meal.

4) When equal units of food are employed, at current prices, there is little to choose between the two foods.

BREEDING.

525 LAUGHLIN, H. H. **The Inheritance of Colour in Shorthorn Cattle.** — *The American Naturalist.* Vol. XLV, No. 540, pp. 705-742; No. 541, pp. 1-28. Lancaster, Garrison, New York. December 1911, January 1912.

United States

Shorthorn cattle often have offspring differing in colour from the parents; whether both parent animals have the same or a different colour of coat, it is always uncertain which of the three Shorthorn colours will appear in a calf to be born. This is illustrated by the colours of some of the cattle bred by Amos Cruickshank at Sittyton, which are set out in Table I (after R. Bruce).

TABLE I.

Colour of matings	Colour of offspring: Red	Red and White	Roan	White	Total
a) Red × Red	133	12	34	1	180
b) Red × Red & White	31	11	6	0	48
c) Red × Roan	278	25	265	0	568
d) Red × White	1	0	41	4	46
e) Red & White × Red & White	0	2	0	1	3
f) Red & White × Roan	22	22	40	2	86
g) Red & White × White	0	1	1	1	3
h) Roan × Roan	56	10	183	60	309
i) Roan × White	0	0	12	12	24
k) White × White	0	0	1	2	3
	521	83	583	83	1 270

A further Table, worked out on the basis of pedigrees (after Wentworth) shows that from the pairing of different coloured Shorthorns 127 white, 645 roan and 892 red calves resulted. Want of space precludes our reproducing the other examples quoted by the Author; we may only adduce a single case in which a white calf was bred from two red parents (after E. M. Hall, see p. 725).

In connection with his data concerning the colour of Shorthorns, the Author suggests the following hypothesis in explanation of the three-fold colour.

In Shorthorn cattle there exist intermingled two genetically independent sets of hairs, which form the characteristic colour markings of this animal.

One set is alternatively *positive white* (*W*) and *red* (*R*), white being dominant and red recessive; the other set is alternately *red* (*R*) and *albinic white* (*wr*), in which red is dominant and white recessive. The dominant white is formed by an anti-body present in the zygote, which retards or completely prevents the development of the determinants of any colour. The same anti-body in

a larger quantity destroys the colour determinants and thus forms recessive white (albinic white), which occurs in albinism.

It may be assumed that the dominant white originates from the Romano-British cattle and recessive white from the Dutch cattle; it represents a strain of partial albinism. Coarse mosaic or spotted colour pattern sprang from Dutch bulls imported in the 18th Century. The spots of Group I (dominant white) are found on the fore and hind flank, the under line and the median line of the body, above the face and a fine network extending over the remainder of the body. Group II (recessive white) covers the neck, sides, back, hind quarters and legs in a network exclusive of the areas of Group I.

The Author uses the following symbols:

W = Inhibitor of pigment formation.
w = Absence of such inhibitor.
R = Determiner for red pigmentation.
r = Absence of determiner for red pigmentation.

With reference to Set No. 1, or group - unit No. 1, individual cattle are gametically $W_2\ r_2$, $Ww\ R_2$ or $w_2\ R_2$; with reference to group - unit No. 2 they are $w_2\ R_2$, $w_2\ Rr$ or $w_2\ r_2$. There are therefore involving these characters nine gametic and three somatic types of individuals, which types are set forth in the following table:

TABLE II.

	Gametic Composition		Somatic Aspect	Blood	Unit Purity	
	Set 1	Set 2			Set 1	Set 2
1	$w_2\ R_2$	$w_2\ R_2$	Red	Pure	Duplex	Duplex
2	$w_2\ R_2$	$w_2\ Rr$	Red	Mongrel	Duplex	Simplex
3	$w_2\ R_2$	$w_2\ r_2$	Roan (1)	Pure	Duplex	Nulliplex
4	$Ww\ R_2$	$w_2\ R_2$	Roan	Mongrel	Simplex	Duplex
5	$Ww\ R_2$	$w_2\ Rr$	Roan	Mongrel	Simplex	Simplex
6	$Ww\ R_2$	$w_2\ r_2$	White	Mongrel	Simplex	Nulliplex
7	$W_2\ r_2$	$w_2\ R_2$	Roan	Pure	Duplex	Duplex
8	$W_2\ r_2$	$w_2\ Rr$	Roan	Mongrel	Duplex	Simplex
9	$W_2\ r_2$	$w_2\ r_2$	White	Pure	Duplex	Nulliplex

(1) Roan in this Table denotes any animal with white and red hair in a coarse or fine mixture, without regard to proportion or pattern.

Now, if two sexual cells of the structure indicated in Table II combine, 45 different mixtures are possible. These mixtures explain the fact that many Shorthorn animals look like mongrels; the cause lies in the different behaviour of two genetically independent units contained in it.

In Table III we give a few examples of the 45 possible combinations; the whole of this Table can unfortunately not be reproduced for want of space.

It frequently happens with these matings that the same parental elements enter and the same offspring in point of aspect may be expected, but these elements are differently combined in the individual animals. Examples of this are numbers 8 and 9, numbers 19 and 20 and numbers 34 and 35 in Table III; the figures in question are connected by an arrow.

If red Shorthorns are mated as in No. 30, Table III, there result about 75 % of red and 25 % of roans. There are however reds which will produce only reds as in matings No. 6 and No. 15 (see Table I*a*). If roan parents generate white offspring, this may be due to a mating like No. 25 or No. 26 (¼ of the products are white), or from a mating such as No. 28 (3/16 white), or also No. 34 (½ of offspring white). The product itself from the point of internal structure, is either like type 6 or 9, Table II. Paired with other red Shorthorns it would produce only roan calves with a mating like No. 20; with a mating like No. 23 there would result 50 % of roan and 50 % of red, and with a mating like No. 35 50 % roan and 50 % white; in a mating like No. 42, if the white were mated with a roan, only white calves would be produced.

Pairing roan with roan, a high percentage of roan results (see Table I, *h*). This suggests that many roans are pure. In No. 1 (Table III) roans are really pure and produce only roan posterity of similar germ cell structure to the two parents. In matings 8, 9 and 19 roans spring from roans but with dissimilar structure.

A white calf from two perfectly red parents is either of very rare occurrence or does not occur at all (Table I. *a*). A case of this kind was cited above (M. Hall); this may be a case of mutation or such an animal may also be regarded as a complete albino. It is much more probable that both parents are never entirely red, and therefore, keeping to the nomenclature of this article, can be described as roan. The explanation of the manner in which they produce a white calf is then easily found (Table III, 25, 26, etc.).

The form of the different colour markings in the Shorthorn hair coat is explained by the fact that generally the darker pig-

ments are dominant over the lighter, covering the latter, in the order: black, red, yellow, albinic white, the preceding colour always covers all following ones. Dominant white however is not covered by any colour: it is dominant over all (as an example Davenport's experiments with the Silkies and Leghorn Fowls are quoted). If, then, the white Shorthorn coat be regarded as a mixture of dominant and recessive (albino-white) and an animal of this white be paired with a red Shorthorn (duplex red), the red covers the albinic white and the latter therefore appears red; the dominating white remains, and as both whites form a network over the body, there result the well-known roan-coated animals. Spottiness or a mosaic mixture may arise if the network is coarser. If a white Shorthorn of type No. 9 (Table II) is paired with a black Angus animal, the black covers the albinic white and there result the well-known blue-roan hybrids in full agreement with the theory here developed. In mating Angus with Herefords, black covers the red, but not the dominant white of the forehead. It may consequently be supposed that the different Shorthorn colours arise from intra-zygotic reactions, but that the last units are not altered, and may appear in other combinations in the posterity.

WORK OF LIVE - STOCK ASSOCIATIONS AND OTHERS FOR ENCOURAGEMENT OF BREEDING.

UJHELYI, IMRE. **Report of the Cattle Breeding Association of Magyaróvár on the Working Year 1910-1911.** (Jelentés a magyaróvári szarvasmarha tenyesztö egyesület 1910/11). — *Tizenotodikévi müködéséröl*. Magyaróvár, 1911. **526**

We extract from the Report of the Magyaróvár Cattle Breeding Association on the working year 1910-1911, the fifteenth since the foundation of the Association, the following particulars: **Hungary**

M. Imre Ujhelyi, Secretary of the Association, reports that the results of the year ending on the 30th September 1911 have been very favourable, and the most remarkable fact has been that the sale by public auction of breeding bulls reared by members gave an excellent result, and that furthermore the members, most of them small peasant proprietors, obtained for young bulls 15 months old up to 3 000 crowns (£125) a price with which breeders of pure Simmenthals might also be satisfied.

The association organised milking competitions in three communes, in order to increase the milking capacity of the cows owned by members.

The commune of Levél gave fairly good results in this connection and the Association has taken the necessary steps for extending these competitions in the future in several communes of the Comitat.

The Association has greatly fostered cheese manufacture and has also endeavoured to introduce the production of hard cheeses into the Comitat.

As to pig breeding, the Association being insufficiently supported by the State, was unable to attain noteworthy results.

In order to rationalise the design and equipment of sheds and byres, the Association provided prizes of 100 crowns (4 guineas) to be paid to farmers who built their cattle houses according to the plans of the Association and in keeping with hygienic requirements.

The Association sold by public auction on the 25th February 1911, 20 bulls from 1 to 2 years old at the average price of 1030 crowns

TABLE III (*Extract*).

Number	Parent *A*	Parent *B*	Intermediate calculations	Gametic and somatic composition of offspring
1	Set 1 $(W_2\ r_2)$ Set 2 $(w_2\ R_2)$ *Somatic effect* Roan 7*	$(W_2\ r_2)$ $(w_2\ R_2)$ Roan 7	$= 4\ W_2\ r_2$ $= 4\ w_2\ R_2$	$16\ W_2\ r_2\ w_2\ R_2$ Roan 7 (100 %)
6	$(w_2\ R_2)$ $(w_2\ R_2)$ Red 1	$(w_2\ R_2)$ $(w_2\ R_2)$ Red 1	$= 4\ w_2\ R_2$ $= 4\ w_2\ R_2$	$16\ w_2\ R_2\ w_2\ R_2$ Red 1 (100 %)
8	$(W_2\ r_2)$ $(w_2\ R_2)$ Roan 7	$(Ww\ R_2)$ $(w_2\ Rr)$ Roan 5	$= 2\ W_2\ r_2 + 2\ Ww\ r_2$ $= 2\ w_2\ R_2 + 2\ w_2\ R_2$	$4\ W_2\ r_2\ w_2\ R_2 + 4\ W_2\ r_2\ w_2\ Rr + 4\ Ww\ R_2\ w_2\ R_2 + 4\ Ww\ R_2\ w_2\ Rr$ Roan 7 Roan 8 Roan 4 Roan 5 (25 %) (25 %) (25 %) (25 %)
9	$(Ww\ R_2)$ $(w_2\ R_2)$ Roan 4	$(W_2\ r_2)$ $(w_2\ Rr)$ Roan 8	$= 2\ W_2\ r_2 + 2\ Ww\ R_2$ $= 2\ w_2\ R_2 + 2\ w_2\ Rr$	$4\ W_2\ r_2\ w_2\ R_2 + 4\ W_2\ r_2\ w_2\ Rr + 4\ Ww\ R_2\ w_2\ R_2 + 4\ Ww\ R_2\ w_2\ Rr$ Roan 7 Roan 8 Roan 4 Roan 5 (25 %) (25 %) (25 %) (25 %)
15	$(w_2\ R_2)$ $(w_2\ R_2)$ Red 1	$(w_2\ R_2)$ $(w_2\ Rr)$ Red 2	$= 4\ w_2\ R_2$ $= 2\ w_2\ R_2 + 2\ w_2\ Rr$	$8\ w_2\ R_2\ w_2\ R_2 + 8\ w_2\ R_2\ w_2\ Rr$ Red 1 Red 2 (50 %) (50 %)
19	$(W_2\ r_2)$ $(w_2\ R_2)$ Roan 7	$(w_2\ R_2)$ $(w_2\ r_2)$ Roan 3	$= 4\ Ww\ R_2$ $= 4\ w_2\ Rr$	$16\ Ww\ R_2\ w_2\ Rr$ Roan 5 (100 %)
20	$(w_2\ R_2)$ $(w_2\ R_2)$ Red 1	$(W_2\ r_2)$ $(w_2\ r_2)$ White 9	$= 4\ Ww\ R_2$ $= 4\ w_2\ Rr$	$16\ Ww\ R_2\ w_2\ Rr$ Roan 5 (100 %)
23	$(w_2\ R_2)$ $(w_2\ R_2)$ Red 1	$(Ww\ R_2)$ $(w_2\ r_2)$ White 6	$= 2\ Ww\ R_2 + 2\ w_2\ R_2$ $= 2\ w_2\ Rr$	$8\ Ww\ R_2\ w_2\ Rr + 8\ w_2\ R_2\ w_2\ Rr$ Roan 5 Red 2 (50 %) (50 %)
25	$(W_2\ r_2)$ $(w_2\ Rr)$ Roan 8	$(W_2\ r_2)$ $(w_2\ Rr)$ Roan 8	$= 4\ W_2\ r_2$ $= w_2\ R_2 + 2\ w_2\ Rr + w_2\ r_2$	$4\ W_2\ r_2\ w_2\ R_2 + 8\ W_2\ r_2\ w_2\ Rr + 4\ W_2\ r_2\ w_2\ r_2$ Roan 7 Roan 8 White 9 (25 %) (50 %) (25 %)
26	$(W_2\ r_2)$ $(w_2\ Rr)$ Roan 8	$(Ww\ R_2)$ $(w_2\ Rr)$ Roan 5	$= 2\ W_2\ r_2 + 2\ Ww\ R_2$ $= w_2\ R_2 + 2\ w_2\ Rr + w_2\ r_2$	$2\ W_2\ r_2\ w_2\ R_2 + 4\ W_2\ r_2\ w_2\ Rr + 2\ W_2\ r_2\ w_2\ r_2$ Roan 7 Roan 8 White 9 $+ 4\ Ww\ R_2\ w_2\ R_2 + 2\ Ww\ R_2\ w_2\ Rr + 2\ Ww\ R_2\ w_2\ r_2$ Roan 4 Roan 5 White 6
28	$(Ww\ R_2)$ $(w_2\ Rr)$ Roan 5	$(Ww\ R_2)$ $(w_2\ Rr)$ Roan 5	$= W_2\ r_2 + 2\ Ww\ R_2 + w_2\ R_2$ $= w_2\ R_2 + 2\ w_2\ Rr + w_2\ r_2$	$W_2\ r_2\ w_2\ R_2 + 2\ W_2\ r_2\ w_2\ Rr + W_2\ r_2\ w_2\ r_2 + 2\ W\ wR_2\ w_2\ R_2$ Roan 7 Roan 8 White 9 Roan 4 $+ 2\ Ww\ R_2\ w_2\ r_2 + w_2\ R_2\ w_2\ R_2 + 2\ w_2\ R_2\ w_2\ Rr + w_2\ R_2\ w_2\ r_2$ White 6 Red 1 Red 2 Roan 3 $+ 4\ Ww\ R_2\ w_2\ Rr$ Roan 5
30	$(w_2\ R_2)$ $(w_2\ Rr)$ Red 2	$(w_2\ R_2)$ $(w_2\ Rr)$ Red 2	$= 4\ w_2\ R_2$ $= w_2\ R_2 + 2\ w_2\ Rr + w_2\ r_2$	$4\ w_2\ R_2\ w_2\ R_2 + 8\ w_2\ R_2\ w_2\ Rr + 4\ w_2\ R_2\ w_2\ r_2$ Red 1 Red 2 Roan 3 (25 %) (50 %) (25 %)
34	$(W_2\ r_2)$ $(w_2\ Rr)$ Roan 8	$(w_2\ R_2)$ $(w_2\ r_2)$ Roan 3	$= 4\ Ww\ R_2$ $= 2\ w_2\ Rr + 2\ w_2\ r_2$	$8\ Ww\ R_2\ w_2\ Rr + 8\ Ww\ R_2\ w_2\ r_2$ Roan 5 White 6 (50 %) (50 %)
35	$(w_2\ R_2)$ $(w_2\ Rr)$ Red 2	$(W_2\ r_2)$ $(w_2\ r_2)$ White 9	$= 4\ Ww\ R_2$ $= 2\ w_2\ Rr + 2\ w_2\ r_2$	$8\ Ww\ R_2\ w_2\ Rr + 8\ Ww\ R_2\ w_2\ r_2$ Roan 5 White 6 (50 %) (50 %)
42	$(W_2\ r_2)$ $(w_2\ r_2)$ White 9	$(w_2\ R_2)$ $(w_2\ r_2)$ Roan 3	$= 4\ Ww\ R_2$ $= 4\ w_2\ r_2$	$16\ Ww\ R_2\ w_2\ r_2$ White 6 (100 %)

*) The numbers refer to table II describing the individuals somatically and gametically.

(£42.18*s*) with a minimum of 600 crowns (£25) for a yearling and a maximum of 1470 crowns (£61.5*s*) for a two-year-old.

It sold by private treaty 25 animals from 15 months to 2 ½ years old, two of them being young bulls of 15 months at the price of 2 000 crowns (£84) and 3 000 crowns (£125) respectively. These two animals were the offspring of dams which had gained first prizes in the milking competitions.

The Association directed its main endeavours towards securing that only the offspring of excellent milking animals should be used for breeding; it attributed far less importance to the question whether the animals used for breeding exhibited in their physical features all the characters of the breed selected for raising (Simmenthal breed).

The herd book kept by the Association contains exact particulars of the animals possessed by the members, and for purposes of sale the Association supplies members with authenticated certificates extracted therefrom concerning the animals to be sold.

The Association also fixes prizes every year for the finest heifers. In 1911, in the three districts of the Comitat, the Association distributed 60 prizes totalling 1 500 crowns (£62.10*s*). 75 small proprietors belonging to 11 communes took part in these competitions, with 86 animals, of which 58 carried off prizes.

The milking competitions referred to above took place in the communes of Levél, Lébeny and Hegyeshalom. The following are the results in the Commune of Levél where the fifth competition since the foundation of the Associatian was held.

Years —	No. of Cows	Average yield in gallons	Contents of Fat
1901 . . .	23	517	3.70 %
1904 . . .	79	586	3.73 %
1906-07 . .	33	650	3.92 %
1908-09 . .	28	714	3.67 %
1910-11 . .	51	743	—

The members therefore took part in the competition in large numbers in spite of foot-and-mouth disease, which caused many ravages; the results show that the favourable influence of the competitions has become more pronounced in the higher average of milking, their being an increase of about 30 % during the period.

The results obtained by the Association as an intermediary in the purchase of chemical manures and seeds of forage crops were likewise very interesting. The quantity of seed distributed in 1910-11

was about 225 qls. (over 22 tons) and of manure (superphosphate) 48 wagons.

The Association continued experiments for several years on the manuring of moor pastures. They found that the use of 200 kg. of superphosphate and 75 kg. of potash per arpent cadastral (about 2 ½ and 1 cwt per acre) yielded an extra crop of 450 to 4 800 kg. (6 ½ cwt. to 3 tons 6 cwt. per ac.). The quality of the hay on the grass-lands thus manured was much superior to that of the unmanured lands and the proportion of good grass had undergone notable increase.

The report of the Association also contains particulars concerning the number of animals in the Comitat; from it we extract the following table for the years 1910 and 1911.

	NUMBER OF						
	Cattle	Buffaloes	Horses	Pigs	Sheep	Goats	Asses
1910 . . .	51 257	114	14 894	33 669	4 754	2 683	35
1911 . . .	50 074	69	15 244	37 764	4 356	3 151	60
Difference	— 2.3 %	— 39 %	+ 2.3 %	+ 12.1 %	— 8.4 %	+ 17.4 %	+ 71 %

Co-operative Dairy Societies in operation in the territory of the Association numbered 17 at the end of 1911, the number of members being 1865 with 3 315 milch cows. The quantity of milk supplied by members during the working year 1st July 1910 to 30th June 1911 was 3 079 519 litres (about 677 750 gallons), of which 972 784 l. (214 100 gal.) were used for butter making, 693 013 l. (152 500 gal.) for cheese making and 1 413 722 l. (311 150 gal.) were consumed in their natural form.

The butter production was 39 921 kg. (39 tons 5 ½ cwt.) that is to say 4.1 kg. per 100 litres (41 lb. per 100 gal.) of milk, and cheese 73 225 kg. (72 tons 1 cwt,) or 10.59 kg. per 100 litres (106 lb. per 100 gal.) of milk.

It is clear from the accounts of the Magyaróvár Cattle Breeding Association for the financial year 1910-1911 that the receipts and expenditure have reached the amount of 204 494 crowns (£8 520 odd), and the Balance Sheet at the end of the year totalled the figure of 45 895 crowns (£1 912) with a profit of 15 486 crowns (£645).

527 DE LAPPARENT. **Live Stock Shows and Prizes.** (Les Concours de primes encouragent l'élevage). — *La Vie à la Campagne*, Vol. XI, No. 127, pp. 21-23. Paris, 1 Janvier 1912.

France

The general Paris Shows and those termed National, organised successively in various parts of France for the encouragement of agriculture, not being accessible to small proprietors who are too economically inclined to attend them, are insufficient, in a country with so many small and medium farms, to generalise progress, particularly in breeding.

Those who exhibit at these larger show are always the same: a sort of breeding aristocracy, and others who have been termed show professionals. Owing to their skill in selecting and preparing the animals to be exhibited they secure the majority of the prizes, and breeding generally does not benefit very much.

Special *Shows of Breeds* which have been held since 1894 in a regular succession, in different towns of a breeding region, have not completely solved the question, as there still remains the superiority of the above mentioned competitors, and also the expense and loss of time to breeders at a distance from the show. For this reason the number of animals exhibited in these breeding shows has always been rather limited.

In 1907 an attempt was made at a reform of the special shows on the following bases, as regards the two breeds, Bordeaux and Pyrenean, in the South West:

1. The selection of a certain number of centres distributed throughout the region where the breed is raised.
2. The appointment of travelling judges.
3. The replacing of prizes of decreasing value by premiums divided into several classes.
4. The elimination of the age section.
5. Dispensing with preliminary formalities of entry.

Each breeder may bring to the show all the animals he thinks fit, which have at least the first permanent teeth; nevertheless one and the same breeder can only receive two prizes for males and three for females.

Bulls when too young, and females more than 12 years old, can only obtain medals. The prizes vary from 125 to 40 fr. (£5 to £1.12s) according to the classes. The judges, three in number, work on the score-card system to facilitate comparison of the animals submitted at different places. Furthermore, with a view to the instruction of breeders, the judges dictate their notes aloud and

publicly to the Secretary, and after classification each breeder receives a duplicate of the score-card of his classified animals.

On the very first occasion some hundreds of animals were shown, and an increasing interest in these shows may be expected among breeders, so much so that breeders in other districts have demanded application of this new system to themselves.

Animals Imported for Breeding Purposes. — *Reports of the U. S. Department of Agriculture, Bureau of Animal Industry: Report for Horses*, p. 3; *Report for Cattle*, p. 3. Washington, December 14 and 16, 1911. 528

According to a report of the Ministry of Agriculture in the United States during the period 1st July to 30th September 1911 there were imported in all 1212 breeding horses and 317 breeding cattle. The following list shows to what breeds these animals belong: United States

I. — *Horses.*

Breed	Stallions	Mares
Belgian Draft	149	47
Clydesdale	34	18
French Draft	4	—
Hackney	6	9
Percheron	586	164
Shetland Pony	9	45
Shire	42	3
Suffolk	12	16
Welsh Pony	10	58
Total	852	360

II. — *Cattle.*

Breed	Bulls	Cows
Alderney	1	—
Ayrshire	14	99
Guernsey	5	89
Jersey	7	100
Shorthorn	2	—
Total	29	288

529 **Live Stock and Fresh Meat Imports into Great Britain in 1911.** — *The Meat Trades Journal,* Vol. XXXV, No, 1237, pp. 46-47. London, January 11, 1912.

Great Britain

The imports of live stock and fresh meat into Great Britain in 1911 and the chief exporting countries may be seen from the following table.

A. *Imports of live stock.*

Country	Cattle	Sheep
United-States	155 816	42 805
Canada	42 239	4 868
Channel Islands	2 342	—
Total	200 397	47 673

B. *Meat imports.*

Beef	7 362 434	cwts.
Mutton	5 337 451	»
Pork	452 932	»

The percentages contributed by different countries to these imports are:

	Beef %	Mutton %	Pork %
United-States	2,37	—	0,92
Argentina	83,89	34,83	—
Australia	13,15	61,32	—
Holland	—	2,13	81,76
Belgium	—	—	3,21
Other Countries	0,59	1,72	14,11
Total	100,00	100,00	100,00

HORSES.

KRAMER, H. **The Mongolian and the so-called Assyrian Wild Horse.** (Die mongolischen und die sogenannten assyrischen Wildpferde). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, 27. Jahrgang, Stück 3, pp. 33-37. Berlin, 20. Januar 1912. **530**

Germany

The descent of our different breeds of horses cannot be regarded as thoroughly elucidated at the present time. There is, it is true, no difficulty in conceiving that in prehistoric times primitive horse types differing little from each other became widely scattered in space. Then the animals living in the grass-growing low lands increased in bodily size and weight owing to plentiful nutrition, while in mountainous regions, owing to privation and unfavourable climatic conditions pony-like animals arose; finally in desert regions a specially speedy type of horse gradually developed, because in speed alone could salvation be found from beasts of prey, and further because a great deal of motion was required to secure a sufficiency of food from a sparse vegetation.

The zoologist Keller of Zurich adopts the view that the Oriental horse is also descended from *Equus Przewalskii* but this is the very instance in which the descent is not proved with certainty. If the Oriental horse has come from *E. Przewalskii*, there should be intermediate forms between the two types. As proof of the existence of such intermediate forms illustrations and bony remains lighted on by chance might serve. Tscherski has measured bones of this kind and found that the brain part of the head is broader than the average of the Arab horse, and that the supraorbital ridges likewise do not project above as with the Arab horse. From this he concludes that the two belong to different types. Noack found considerable differences between the tooth structure of *E. Przewalskii* and the Oriental horse and of these the Author has likewise satisfied himself.

Although he regards the descent of the Oriental horse from *E. Przewalskii* as very possible, he utters a warning against endeavoring to draw conclusions from the very inadequate material at present available. Though illustrations lighted on by chance have some value, they should not be over-estimated, because allowance

must be made for the personal and not strictly objective element in the artist's reproduction of the animal. Likewise the bones found up to to-day do not suffice to settle the question. If minutely accurate measurements of single animals or individual bones are made, and the relationship between different types asserted or denied on the basis of the results, mistakes are inevitable. The Author hopes, nevertheless, that the investigations of natural science, and examination of bones, will yield more precise information on the present question if more plentiful material can be found.

531 SCHULZE, C. **Investigations into the Growth of the Hoof of Horses.** (Untersuchungen über das Wachstum des Hufhorns der Pferde). — *Deutsche Landwirtschaftliche Presse*, 39. Jahrgang, Nr. 7, pp. 67-68. Berlin, 24. Januar 1912.

Germany

The Author examined the growth of the hoof by measurements carried out on 800 hoofs; the chief results of his work are as follows:

1. The growth of the wall of the hoof averages 7.66 mm. per month. Unshod hoofs grow 8.6 mm. on the average per month, and shod hoofs only 6.73 mm.

2. The rapidity of monthly growth ranges, for unshod hoofs, between 4.4 and 9.3 mm.

3. The average growth may be greater in one month than in another.

4. The fore and hind hoofs grow at about the same rate, but the rate of growth of the different hoofs is seldom quite uniform.

5. The hoof growth around the coronet is uniform in 90.6 % of all hoofs and irregular in 9.4 %. Irregular growth rarely occurs with regular shapes of hoof.

6. When unshod hoofs are shod, there is an arrest of growth. Good care of the hoofs and good shoeing, especially that method of shoeing by which the hoof approximates more to natural conditions (seated shoes and half-shoes) may reduce this injurious effect.

7. The hoofs of horses aged from 5 to 10 years have on the average a monthly growth 0.28 mm. faster than the hoofs of horses aged from 11 to 19.

8. The colour of the hoof has no relationship to its rate of growth.

9. The duration and description of work does not affect the rapidity of hoof growth to any ascertainable extent.

10. In foundered hoofs the heel possesses a more powerful growth than the toe and quarters. In hoofs shod with bar-shoes

the toes grow 2-5 mm. more per month than the remaining wall sections. Injuries to the hoof coronet give rise to an additional growth up to 7 mm. per month in the corresponding part of the wall.

11. Single dressings with Cantharis ointment or cauterisation of points on the coronet usually results in an increased growth of 3 mm. in the wall in the month following. A better result is obtained by frequently repeated dressings with ointment, but there is no specific capable of permanently increasing the horn production.

12. Hoofs in which the volar or plantar nerves are severed grow on the average 2-5 mm. per month more than sound hoofs.

13. General diseases as a rule lead to no arrest of hoof growth; indeed there is often an enhanced growth after recovery from a disease. The hoof horn however becomes dull when the animal is ill and shows a deficiency in moisture and elasticity.

SHEEP.

THILO, HANS LUDWIG. **The Objects of Intensive Sheep Breeding.** (Ziele des intensiven Schäfereibetriebes). — *Deutsche Landwirtschaftliche Presse*, 39. Jahrgang, Nr. 4, p. 29. Berlin, 13. Januar 1912. **532**

Sheep breeding must not be made secondary to intensive crop growing, but it must be adapted to the latter; if this is done its continuance even on farms devoted to the most intensive crop growing, such as sugar-beet farms, is not only possible but is necessary, because fodder which can only be turned to account by sheep is found everywhere. It should not be our aim to breed sheep with the finest possible wool, but raising lambs should be the main source of revenue and the wool regarded as a by-product; like straw in the case of grain. **Germany**

The sheep should reproduce as young as possible, from 1 year to 18 months. The Author says that his experience proves this to be perfectly feasible in practice. It is precisely the very early maturity of the sheep which forms a very valuable property, and gives it a great superiority over large cattle.

If lamb fattening is carried on, the food used is converted into money after a maximum of seven months, because at this age

the lambs are ready for the butcher. If pigs are fattened so young, why should the like process not be applicable to sheep? The sooner the lambs are ripe for the butcher the cheaper is the fattening, the less the risk, and the better the quality of meat. According to H. Fischer, "Lehrbuch der vergleichenden Histologie" p. 114, it is the young cell which is the most capable of assimilating, and K. v. d. Malsburg also points out in his book: "Die Zelle als Form- und Leistungsfaktor unserer landwirtschaftlichen Nutztiere" that in the young organism all other cell functions are restricted to a minimum in favour of growth. The young cell however also forms but little protective substance against disease germs, and therefore it cannot be otherwise than an advantage to send the lambs to the slaughterhouse as young as possible. Finally the quality of the young meat is due to its large contents of muscular substance and the small proportion of fat therein.

Intensive feeding when young should however also be practised for lambs intended for later breeding, because it results in earlier sexual maturity and further develops the precocity of the breed. The breeding stock should be perfected by pure breeding if a breed is available or has been created corresponding to the particular conditions. Fatting lambs however are best produced by crossbreeding, in order to secure the maximum fattening powers.

If two lambing times are arranged for, one in the middle of October and the other in the middle of May, the labour of the feeder will be uniformly utilised almost throughout the year with a 7 to 9 months fattening period.

The future will show whether lambing twice a year is feasible with sheep. The Author has already begun to carry out in practice the methods sketched out here, and he thinks it desirable that his principles should be further and more generally followed up.

GOATS.

538 SPRINGFIELD, K. **Should Goats be Distinguished by the Use of Ear Markers or by Tattooing?** (Kennzeichnung der Ziegen durch Ohrmarken oder Tätowierung?) — *Zeitschrift für Ziegenzucht*, 13. Jahrgang, Nr. 2, pp. 24-26. Hannover, 15. Januar 1912.

Markers on the ears should not be employed for distinguishing

Germany breeding goats; whatever system is adopted, there is always the

possibility of the animals, during pasturage or in the shed, getting the ear marker caught and slitting their ears, which mostly means the loss of the marker as well. These drawbacks may be avoided by tattooing the signs (numbers or letters) on the ears. The cost of tattooing scarcely exceeds that of the ear marker system. Good tattooing pincers with interchangeable types and a little German black and spirit is all that is required. Tattooing nippers with several spaces are used, into which several types can be inserted. It is advisable to put on one ear the Herd Book number of the corresponding animal, and transversely thereto (horizontally) to tattoo the association mark, while in the other ear the number of the dam, and to it a figure indicating the year of birth, are tattooed.

PIGS.

SPENCER, SANDERS. **Green Food For Pigs** (1) — *Live Stock Journal for 1912*, pp. 193-196. London. **584**

Great Britain

The old method of rearing pigs on very short diet and then rapidly fattening them with large quantities of barley meal or other expensive foods is no doubt well adapted for the production of very fat pigs, but they hardly fetch as high a price as animals fed from their early days with comparatively cheap food but a sufficiency of it, who have therefore been able to build up their body. Animals fed in this latter way yield excellent meat instead of the excessive quantities of fat found in pigs fed on the old method; besides this they are ready for the market much sooner.

A method of feeding having much to recommend it is summer pasturing. Mr. Spencer reports on a farm in an English midland county, where between seven and eight hundred pigs are annually folded on permanent or temporary pasture. The animals are bought when about 10 weeks old, and are then, in addition to pasture, given a small daily ration of sharps in the form of thin slop, and also mangolds and cabbages; later on, when the pigs grow stronger, they are given peas and beans instead of sharps. Towards the end

(1) See also *B.* Feb. 1911, No. 374. (*Ed.*).

of August the largest animals are put into yards and fed on various meals, with an addition of green fodder. In the course of two or three months they are sold off fat. The results of this method of pig fattening are highly satisfactory.

The Author further says that pig fattening with meal exclusively is more expensive than if a mixture of meal and potatoes is fed to them. He refers in proof of this to the experiments of the Wisconsin Experiment Station, in which it was found that with pure maize meal feeding 440 lb. of maize meal were required to produce 100 lb. increase in live weight. This same increase in live weight was secured by means of 262 lb. of maize meal and 786 lb. of cooked potatoes. (Ratio of maize meal to potatoes = 1 : 3).

535 MEYER, GEORG. **The Value and Digestibility of Foods.** (Uber den Wert und die Verdaulichkeit der Futtermittel). — *Mitteilungen der Vereinigung Deutscher Schweinezüchter*, 19. Jahrgang, Nr. 2, pp. 29-32. Berlin, 15. Januar 1912.

Germany

To make pig fattening successful, everything detrimental to the well-being of the animal must be avoided, such as dark and bad sties, irregular meal times and badly composed, poor flavoured food mixtures. The breed is also an important point: highly bred pigs derive more benefit from their food than the common stocks.

Pigs digest young green fodder better than old, in which the fibres have become woody. According to the experiments of Professor Lehmann, of Göttingen the following is the percentage digested of the substances contained in red clover:

		Organic matter %	Protein %	N-free extract %	Crude fibre %
Pig . . .	Red clover, young, without flowers	54	49	71	24
	Red clover, beginning to flower	40	33	57	16
Wether .	Red clover, beginning to flower	66	71	74	47

On the strength of careful feeding experiments Professor Lehmann divides foods for pigs into three classes, according to the proportions of organic matter digested :

Class I over 90 %		Class II 80-90 %		Class III below 80 %	
Potatoes	94 %	Barley	81 %	Palmnut cake	68 %
Sugar beets	95 %	Wheat	83 %	Bran	67 %
Beetroots	90 %	Beans	80 %	Rice meal	66 %
Maize	91 %	Cocoanut cake	80 %	Brewers' grains	48 %
Peas	91 %	Linseed cake	80 %	Green fodder	40-54 %
Meat meal	92 %	Dried beet slices	80 %	Ensilaged beet leaves	70 %
Milk	95 %	Ensilaged beet slices	80 %		
Molasses	100 %				

The effects of the foods are mutually supplemented and completed by mixing, and any harmful properties a particular food may possess are thus toned down.

RICHARDSEN, Prof. Dr. **Pig Fattening Experiments with Dried Yeast in Comparison with Meat Meal.** — *Deutsche Landwirtschaftliche Presse*, 39. Jahrgang, Nr. 5 and 6, pp. 42-43 and pp. 49-50. Berlin, 17. and 20. Januar 1912. **536**

Germany

Breweries have begun to prepare a food from yeast by drying. Up to now not much experience is available on dried yeast feeding. The Author therefore from the 20th July to the 25th October 1911 carried out a feeding experiment on six pigs (Yorkshire crossbreds) three of which were given dried yeast in addition to other food. The animals were the offspring of two sows and were born on the 29th and 31st December 1910. For the experiment two groups (*A* and *B*) each of three pigs were formed. The experiment itself was divided into two periods.

The following was the composition of the foods used, found by analysis:

	Dry Matter %	Protein %	Fat %	Nitrogen-free extract %
Barley	87.64	12.26	2.15	63.98
Sliced potatoes	90.11	4.01	0.22	77.74
Meat meal	90.56	80.56	8.16	—
Dried yeast	90.86	42.30	0.35	34.60
Linseed	93.16	21.69	34.56	23.62

The following quantities of food were given per 1 000 lb. live weight per day:

Period I.

Group A: 20 lb. barley meal; 12 lb. potato slices; 3 lb. meat meal.

Group B: 20 lb. barley meal; 9 lb. potato slices; 6 lb. dried yeast and 1 lb. linseed.

Period II.

Group A: 18 lb. barley meal; 10 lb. potato slices; 2.5 lb. meat meal.

Group B: 18 lb. barley meal; 7 lb. potato slices; 1 lb. linseed.

In addition the pigs were given ¼ oz. of rock salt and phosphate of lime each, per day.

The linseed was fed to Group B to give the ration the necessary admixture of fat.

It was at first feared that the dried yeast would be distasteful to the animals in consequence of its bitter flavour, but in all cases they entirely cleared up their ration; there were also no health troubles when the proportion of yeast was gradually raised from 0.8 lb. to 1.2 lb. per head per day with increase of live weight. The daily gain in live weight per animal averaged 1.39 lb. in Group *A* and 1.29 lb. in Group *B*.

Altogether in the course of 98 feeding days an increase of 396 lb. in live weight was secured in Group *A* and of 380 lb. in Group *B*. When the pigs were killed Group *A* was found to have a dead weight of 79.01 % and Group *B* 79.32 %.

The Author does not think that the rather low increase in live weight found under yeast feeding forms any obstacle to the general use of dried yeast for pigs, chiefly as an accessory in the place of meat meal or similar foods. The price moreover should not be more than 60 % of that of meat meal.

POULTRY.

PEARL, RAYMOND and MAYNIE, R. CURTIS. **Studies on the Physiology of Reproduction in the Domestic Fowl. V. Data Regarding the Physiology of the Oviduct.** — *The Journal of Experimental Zoology*, Vol. 12, No. 1, pp. 99-132. Philadelphia, January 5, 1912. **537**

United States

The oviduct of the domestic hen consists of five parts: the infundibulum, the albumen-secreting portion, the isthmus, the uterus and the vagina. The Authors, by weighing normally laid eggs, and by exceedingly accurate determination of the weight of the different parts (shell, membranes, white and yolk), and likewise by dissection of hens and careful examination of the eggs taken from the oviduct, have tried to find out the way in which the several parts of the oviduct co-operate in the formation of the egg.

They found that the yolk, after entering the infundibulum, remains more than three hours in the albumen portion of the oviduct but only receives here from 40 to 50 % of the total weight of albumen in the egg, and not the whole of the albumen as was hitherto supposed. In the portion of the oviduct just referred to there were formed the chalazae, the inner layer of fluid albumen and the dense albumen.

The egg passes through the isthmus in something less than an hour; in the isthmus it receives the shell membrane. At the same time, and also during its subsequent stay in the uterus, the outer layer of fluid albumen is formed, the weight of which is 50-60 % of the total weight of albumen.

This thin albumen is taken up by osmosis through the egg membrane; on entering the egg it is much more liquid than in the laid egg. A diffusion process now takes place in the egg, by which the albumen first formed becomes thinner and that entering the egg later thicker in consistency.

The increase of albumen is only completed after the egg has remained for five to seven hours in the uterus. Before the absorption of albumen is quite terminated the formation of the shell begins, which requires from 12 to 16 hours for its complete development.

538 WILSON, W. A. **Government Poultry Fattening Stations in Saskatchewan, Canada.** — *Dept. of Agric. of Saskatchewan, Bulletin* No. 25. pp. 1-32. Regina, Sask., Canada, 1911.

Owing to the general disregard of the poultry business in Saskatchewan, the Government in 1907 adopted an educational policy of a practical and commercial nature for promoting the poultry industry.

Canada

The fattening station was thought to be the best method of carrying out this policy, as the actual conduct of the work could be seen and would be a practical demonstration to each farmer with his own birds, of how to prepare them and how and where they might be marketed.

While the chief object of these stations was to educate by concrete demonstrations, they have also brought increased monetary returns to those who have placed their birds therein for fleshing. This latter result has added greatly to their popularity.

For the past four years the dairy branch of the department of Agriculture of Saskatchewan has conducted poultry fattening stations at several of the government operated creameries, and the writer, superintendent of Dairying, has demonstrated beyond doubt or question the existence of an almost unlimited demand for plump chickens, well fleshed and attractively prepared and packed. He has shown also that Saskatchewan farm-raised birds can be profitably fitted to meet this demand.

The tabulated statement given below presents a summary of the work done at the fattening stations:

(4.86 Canadian dollars = £ 1).

Year	No. of Birds	Live Weight before fattening lb.	Dressed Weight lb.	Value Dressed $	Fattening cost per lb. dressed weight $	Selling price: per lb. dressed weight $
1907	494	1 530	1 930	374.03	0.0588	0.1938
1908	1 861	6 231	6 920	1 243.52	0.0536	0,1797
1909	2 984	11 074	10 820	1 909.72	0.0602	0.1765
1910	1 333	4 705	5 094	1 016.25	0.0668	0.1995
Totals and averages.		23 540	24 764	4 543.52	0.0598	0.1874

The fattening cost includes the labour for feeding and plucking and also the cases in which the birds were packed for shipping. It was difficult to secure the right kind of feed and some of it cost as high as $2.50 per hundredweight (11 *s.* 6 *d* per Imperial

cwt.). For the four years the average dressed weight per bird was 3.23 pounds and the average selling price 60.53 c. per chicken.

A large percentage of the birds was of a very poor type for feeding and on the whole did not make creditable gains. In all instances, however, the quality of the flesh was so much superior to that of the ordinary bird offered to the trade that wherever a sample case was sent to the dealer the quality and appearance of the birds brought business.

WILSON, W. A. **Fleshing Chickens for Market in Canada.** — *Dept. of Agric. Saskatchewan, Canada: Bulletin*, No. 25, pp. 1-32. Regina, Sask., 1911. **539**

Canada

The most desirable poultry breeds for table trade, are the commonly called American and English utility breeds.

Both classes are classified below.

American Class.

Breeds	Varieties
Plymouth Rocks	Barred White Buff
Wyandottes	Silver Golden White Buff Black Partridge Silver Pencilled Columbian
Javas	Black Mottled
Dominiques	Rose Comb
Rhode Island Reds	Single Comb Rose Comb
Buckeyes	Pea Comb

English Class.

Dorkings	White Silver Gray Coloured

Redcaps	Rose Comb
Orpingtons	Buff Black White

The choice should be fixed on one of the common breeds such as Barred Rock, White Wyandotte, Buff Orpington or Rhode Island Reds.

A bird that will put on the most flesh for the least money in the shortest time must have short back, short neck, plump, well rounded breast and not be leggy; it should show every sign of a healthy, vigorous constitution.

During the breeding season birds showing the best conformation should be separated from the rest of the flock and subsequently placed on the egg and egg record. The stock produced from such eggs can be followed from year to year and the selection continued. An astonishing improvement in the build and conformation of the birds is quite possible within a short time.

The writer makes the following recommendations to poultry fatteners.

Birds of the utility breeds which are easily fattened and are in demand by the general trade should weigh from 3 to 3 ½ pounds when put into the feeding crate.

The egg-laying breeds are not suitable for fattening. Be careful not to overfeed chickens the first week. Feed lightly and remove any feed left in the trough half an hour after feeding. Keep the troughs clean and sweet.

After the first week give chickens all they will eat, regularly twice a day.

The oats or mast must be ground very fine. Oats ground for horse feed are not suitable.

Feeding skim milk or buttermilk whitens the flesh, which is desirable.

Put a little salt in the feed.

Give water in the trough twice a day.

Give some form of grit twice a week. Sifted gravel will do. Feed tallow during the last ten days; begin with one pound per day to 70 or 100 chickens and increase to one pound to 50 or 70 chickens. To prepare tallow: weigh quantity required for three days, melt it, and thicken, while hot, with ground oats. Mix one-sixth of this paste with the morning, and one sixth with the evening feed.

If a chicken gets off its feed remove it from the fattening pen for a few days, allowing it to run free.

Do not allow birds any food for 36 hours before killing. Kill chickens by dislocating the neck and use care so that no outside blemish is made. Market birds with heads and feet on. Dry, pluck at once, while the bird is warm. Observe the buyer's wishes as to whether the bird should be stripped of all feathers or a rim left on the first wing and leg points.

Leave about two inches of feathers around the neck. As soon as plucked, place the chicken in the shaping board to give it a compact, square appearance.

Chickens should not be drawn.

When cold, wrap in clean parchment paper, and pack tightly in shipping case to prevent injury by knocking about.

See that chickens, paper and cases are kept perfectly clean.

SWEERS, P. **Incubating.** (Ueber künstliche Brut). — *Deutsche landwirtschaftliche Geflügelzeitung*, 15. Jahrgang, Nr. 16, pp. 203-204. Berlin, 19. Januar 1912. **540**

Germany

Artificial incubation, when carried out wholesale, in most cases hatches less than 50 % of chicks from the eggs. This should form an encouragement for the improvement of the apparatus. When eggs die in the incubator it is always a sign of some defect in the incubating process. Unfertilised eggs carry no living germ, and therefore do not develop and likewise cannot die.

The Author says that according to his experiments an incubating temperature of 39.5° C. is sufficient, and that temperatures fluctuating from 1 to 2° C. for some hours cause no injury.

The incubator may be protected against cooling by being lagged with linoleum. A very important point is that there should not be large interstices between the eggs. They are best placed on a sack in the frame of the incubator during the first 18 days. There should likewise not be much air above the eggs; in this way the natural conditions as with the hen are best reproduced. For airing 30 minutes per day suffice. From the 18th day, but not earlier, aeration should be increased, because the air then gets too moist owing to the moisture from the chipped eggs.

WARREN, MRS. H. F. **Making a Good Duck Record.** — *American Agriculturist*, Vol. 89, No. 1, p. 17. Springfield, New York, January 6, 1912. **541**

United States

For duck breeding the Author has arranged small gardens with a little house in each garden. The duck houses are often cleaned

out. The litter used is sawdust as soon as the ducklings are over three weeks old.

Up to the fourth day of life the ducklings are fed with equal parts of wheat meal and bran; 5 % of sand and grit is added and the whole stirred up with warm water. From the fourth day onward about 10 % of beef and about 30 % of green fodder (fine-cut grass or salad) is mixed with the food. The ducks receive this food up to the age of five to six weeks; from that time the birds intended for killing are fed more plentifully. There are two feeding times a day until the age of two weeks, and later three feeding times. The chief essential is pure fresh food; souring the food is extremely injurious to young ducks. Water for swimming is not necessary, but the ducks should be able to dip their heads in the drinking trough; this is required for the purpose of cleaning the eyes and nostrils. The financial results of duck breeding conducted in this way are, according to the Author, very satisfactory; in the course of last year with 16 Peking Ducks she obtained a gross return of $ 114.20 for hatching and market eggs, and for breeding and killing ducks.

542 POPPE, Dr. and POLENSKE, Dr. **Does Feeding Antimony to Geese Produce Fatty Liver?** (Erzeugt die Verfütterung von Spiessglanz bei Gänsen Fettleber?). — *Deutsche Landwirtschaftliche Presse*, 39. Jahrgang, Nr. 7, p. 68. Berlin, 24. Januar 1912.

Germany

The view is widely held that by the daily administration of a pinch of antimony (*stibium sulfuratum*) to fatting geese a peculiarly big liver could be produced. The antimony is usually mixed with the moistened food.

The Authors endeavoured to verify the correctness of this opinion and at the same time to ascertain whether, when substances containing antimony or arsenic are fed to geese, traces of these minerals can be detected in the livers of the birds. For their experiments seven geese were used; three of them served only as controls; 1-2 grammes made up partly of chemically pure antimony sulphide and partly of ordinary antimony, were administered per goose per day. The condition of the birds was not in the least disturbed.

No action of the antimony on the size and weight of the liver could be detected. Chemical examination of the livers proved however that they had absorbed small quantities of antimony and

arsenic. The quantities varied in the different livers, and appear to be influenced by the individuality of the bird. The Authors lay stress on the fact that the investigations were carried out with a paucity of material.

FRATEUR, J. L. **Study in Ostrich Breeding** (1). (Etude zootechnique sur l'Autruche). — *Bulletin Agricole du Congo Belge*, Vol. II, No. 4, pp. 678-692. Bruxelles, 1911. **548**

Union of South Africa

In the territories of the South African Union the exportation of ostriches and their eggs is only permitted to neighbouring colonies having a legislation identical with the laws in force in the South African Union, namely Southern Rhodesia and German South-West Africa. For export to North-West Rhodesia a duty of £1 per bird must be paid, while the exportation of eggs is prohibited.

There are two methods of ostrich farming practised:

1. The older, pastoral breeding is carried on in the veldt on ranches of about 2 500 acres surrounded by fences; it is simple and the birds are very resistant to disease, but they are very difficult to keep under observation. On the average an area of 20 acres supplies sufficient spontaneous vegetation for the complete feeding of a bird. With the object of improving the pasturage, a number of head of cattle are likewise turned out.

2. The second method, intensive breeding, has been greatly developed of late years in consequence of the energetic construction of artesian wells and dykes, damming the valleys or rivers. The water obtained is used for irrigating the lucerne fields, which provide an excellent food for the ostrich. In grazing on lucerne these birds ruin it to such an extent that only 2 to 3 head per acre can be fed. For this reason the ostriches are often put in enclosures on the desert soil where they are fed with mown lucerne. On this system, 6 to 7 head per acre can be maintained, but the necessary labour is not always available.

Improvement of the quality of feathers will in the future be the main task of breeders, because, in the event of the prices of feathers declining, the ordinary quality would no longer pay expenses.

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(1) For the first part of this article, see *B.* Nov.-Dec. 1911, No. 3195. (*Ed.*).

To achieve this improvement and put the sale of feathers on a solid basis, a Congress of breeders has just asked the Government to prohibit the breeding of ostriches of inferior quality. We may add that the value of the feathers exported from South Africa has increased as follows from 1846 to 1909:

1846	Fr.	200 000	£	7 920	14s
1871	»	3 994 225	»	158 187	2s
1896	»	12 988 475	»	514 395	0s
1909	»	52 452 125	»	2 077 311	16s

United States

In the United States: Florida, California and especially in Arizona, extensive ostrich breeding farms are found, aggregating about 7000 head. Arizona above all is perfectly adapted for this breeding, thanks to its dry climate, a necessary condition for the production of good feathers.

In those parts the cultivation of lucerne is secured by irrigation. In the valley of the Salt River the construction of the Roosevelt dam has just been completed, its artificial lake reservoir having an area of 6 600 hectares (16 300 acres) and containing enough water to irrigate 100 000 hectares of desert (247 000 acres). The water consumers of the Salt River Valley have formed a Company which will in ten instalments repay the total cost of the dam to the Government, which has advanced it without interest.

In the United States, every endeavour is being made to improve production, and probably these efforts will in the future be successful, given the necessary factors. The annual return of an American ostrich is fr. 150 (nearly £6). Verminous diseases, which are very injurious to the young birds, are unknown in America. Home production is protected by an import duty of 20 % on raw feathers.

Argentina

In Argentina, there were in 1897 about 13 000 ostriches. The exportation of feathers is inconsiderable and the prices are low.

Egypt

Egypt exports ostrich feathers annually to a value ranging from fr. 6 000 000 to fr. 10 000 000 (nearly £ 240 000 to £400 000). In 1875 the value of its exports was greater than that of Cape Colony exports. Only one large ostrich farm exists, near Cairo, the principal market for the feathers. In the Sudan, the natives possess domesticated ostriches. Breeding methods are exceedingly primitive. The greater portion of the feathers exported by Egypt come from wild ostriches.

Sudan

In Algeria, endeavours have been made to domesticate the ostrich, but without great success. The wild ostrich has also disappeared. Algeria

Morocco formerly supplied wild ostrich feathers, but the exports have ceased. Morocco

From Tunis and Tripoli some quantity of wild feathers is exported. Tunis Tripoli

In German East Africa and German South-West Africa there are regions which are quite suitable for ostrich breeding. During late years this breeding has undergone great extension there. German East Africa German S. W. Africa

In Madagascar, there are several hundred ostriches. The interior of the Island supplies feathers of greater value than the Coast. Madagascar

In Australia the Zoological and Acclimatisation Society of Victoria in 1870 made the first attempt to acclimatise African Ostriches. The results were not encouraging, but nevertheless breeding farms were established in several places. As lucerne does not thrive in Australia, the ostrich is fed on clover, turnips, cabbages, swedes, etc. Australian feathers are of a rather inferior quality; South Australia alone produces a better quality. Australia

As the production is not nearly sufficient for the country, a large quantity of feathers is imported and pays a duty of 15 per cent on the gross price.

In Europe there is an ostrich breeding farm near Nice, and the establishment of Karl Hagenbeck at Stellingen-Hamburg likewise breeds ostriches for feather production. Good results appear to be obtained. France Germany

COLLINGE, WALTER E. **Coccidiosis in Fowls and Game Birds.** — *Second Report on Economic Biology*, pp. 50-53. Birmingham, 1912. 544

A number of cases of *Coccidiosis* in fowls and game birds have been enquired into.

It is a disease which seems to be on the increase in this country, and is due to a parasite which belongs to the group of Protozoa known as *Coccidia*, which destroys the mucous membrane of the intestine, setting up enteritis and diarrhoea. The disease usually has a fatal effect upon the host. Great Britain

The particular species found in the body of the fowl is known as *Eimeria* (*Coccidium*) *avium*.

The birds, when early infected, stand about, droop their wings and utter plaintive cries. They eat and drink far more than healthy birds, but, nevertheless, become thinner, the muscles of the breast

and legs showing this to a marked degree. The loss of weight is remarkable.

The infected birds also become markedly anaemic, the comb, wattles and cere becoming pale and bloodless.

The feathering also is very weak compared with that of healthy birds; that of the legs is ragged, the quills are less rigid, the sheen on the feathers is less developed, and the replacement of nestling down by ordinary feathers is much retarded in diseased birds.

Owing to the attack of the parasite on the mucous membrane of the alimentary canal, digestive troubles occur.

Death from *coccidiosis* is often sudden; the corpses of all birds dying from the disease should be burnt, for the cysts, which are the resistant forms of the parasite, remain infective for long periods, even for a year or more, long after the disintegration of the body of the first host.

Dissemination of the Disease.

The malady spreads with remarkable rapidity. The faeces are the chief source of contamination, and as these dry, they are distributed by the wind in the form of dust, which contains the parasites in various stages of development.

The parasites are taken into the body of the fowl by the fouling of food and drinking water.

Rain is an important factor in dispersing the dejecta of infected birds.

A small dipterous fly, *Scatophaga stercoraria* Linn., lays its eggs in these droppings and the larvae develop there. Such larvae and flies were found to contain in their intestines and dejecta the oocysts of the parasite.

Preventive and Remedial Measures.

1) All dead bodies and infected droppings should be burnt; and where an outbreak occurs among a small number of birds, the best plan is to destroy the lot.

2) The ground should be treated with a liberal application of ground *unslaked* lime, and this should be allowed to lie on the surface for a few days before being turned in.

3) The same land should not be used as a run for at least a year.

4) A thorough cleansing of pens, perches etc. should be given, and all well lime-washed before being used again.

5) Eggs, before being set for hatching, should be carefully wiped over with 90 per cent alcohol, or strong methylated spirit, and then dried.

Various drugs have been tried, such as ferrous sulphate, sodium salicylate, catechu.

The last remedy has been used with success on several large poultry runs where heavy mortality through *coccidiosis* had occurred in previous years.

Ferrous sulphate, 10 grains in one gallon of drinking water (and also a much stronger solution) gave very encouraging results; indeed anything that will help to raise the general vitality of the birds, will probably aid in resisting the action of the parasite.

BEES.

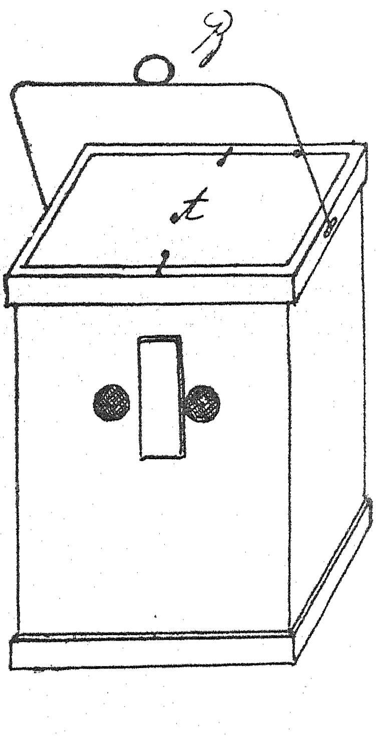
Elimination of the Swarming Instinct. (A Novel Suggestion). — *The Canadian Bee Journal*, Vol. 20, No. 1, p. 7. Brantford, January 1912. 545

Everybody nowadays is interested in the matter of the " elimination of the swarming instinct " and many are convinced as to its practicability. An interesting and a novel suggestion is made by a recent writer to the effect that " the No. 1 gland system of the worker " plays a prominent part in the " mechanism which controls swarming ". The writer proceeds to state that an excess of the secretion gives rise to the construction of queen cells and the desire to swarm. A contracted brood nest acts therefore by limiting the opportunity for its use. On the other hand, the removal of sealed brood gives extra scope to the queen and to the nurse bees. Canada

KELLER, AD. **Box for taking Swarms.** (Mein Schwarmkasten). — *Deutscher Imker aus Böhmen*, 25. Jahrgang, No. 1, pp. 12-13. Prag, Januar 1912. 546

Figure I shows a Swarm Box made of board 3/4 cm. (1/3 inch.) thick for Gerstung's Apiaries. The box comprises 7 Gerstung whole frames, and can be closed above and below by a board A, which is in each case secured by 2 catches. A wire hook B is fitted above, by which the box is carried. Ventilation is Austria

provided for by two holes on two sides opposite the honeycomb spaces, closed inside by means of wire gauze and outside by a pivoting board. The 7 frames are first covered over with a wax cloth and afterwards with two lid plates (Fig. II: *a*, *b*, and Fig. III) provided with a sort of channel outside in which the frames hang. Finally the board A is placed on top. If a swarm is to be got into the box, the latter is suspended by the wire hook, if possible in such a way that its bottom opening is directly over the swarm, and the box itself just touching the swarm. The Bees will then enter of their own accord. When this is done, the handle permits of taking all seven frames with the Bees out of the box and hanging them in a Gerstung's hive by means of the plates.



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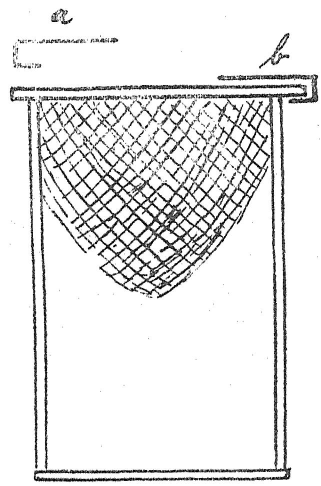
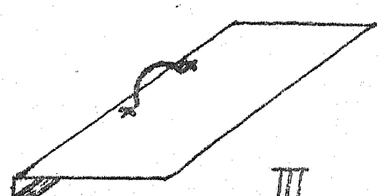


II



III

SILKWORMS.

PAINI, CARLO; BARTEZAGHI, ENRICO; and HONDA, F. **Sericulture in Japan. Situation; Development; Government Initiative.** (La Sericoltura in Giappone. Situazione; Sviluppo; Iniziative del Governo). — *L'Industria Serica*, 1911, No. 51, pp. 2-3; No. 52, pp. 2-3. 1912, No. 1, pp. 2-3; No. 3, pp. 2-3; No. 4, pp. 2-3. Torino, Dicembre 1911, Gennaio 1912. 547

The prosperity of Japanese sericulture is due to Government initiative which may be traced to the Imperial Family.

Japan

In 1908 the Institutes of Sericulture at Tokyo and Kyoto delivered certificates to no less than 2 960 pupils. A third institute is to be opened at Hyeda. Besides these there are 8 smaller provincial institutes and 5 district ones, 4 provincial and 13 district schools. The Government grants subsidies for the increase of mulberry plantations, and encourages frequent exhibitions (at least 50 a year). In all parts of Japan instruction is given, and investigations are made, in the silk industry with great energy and diligence. 7.44 % of the entire cultivable area is devoted to mulberry trees.

The production of silk-worms' eggs is valued as follows:

1) " Cellular " *i.e.* obtained from selected parents, 88 740 558 clusters.

2) " Industrial ", 5 349 216 cards, each card containing the clusters laid by 100 moths.

The production of living cocoons in 1907 amounted to 285 million lbs., of which 185 million were from the spring brood, 39 million summer, and 61 million autumn.

The production of raw silk in 1907 amounted to over 19 million lbs., and of floss silk in the same year to nearly 4 ½ million.

The mulberry tree, except the Chinese variety Roso, is indigenous. *Morus alba* is the commonest.

The bush mulberries (Nogari jitale) are grown in meadows, and on all odd bits of land, road-sides, banks of ditches and of rivers, and borders of fields.

To facilitate silkworm breeding, early, intermediate, and late mulberries are planted in the proportion of 20, 30 and 50 %, res-

pectively. A mulberry plantation lasts from 10 to 20 years, after which it must be renewed elsewhere.

Dwarf mulberry trees are grown in the districts of Gumma, Tokyo, and Fukushima. The high mulberry trees — *Takagari-jitale* and *Kyoboku-jitale* — are much grown at Gumma and Jumanashi. The soil is manured thrice a year, chiefly with slow-acting nitrogenous fertilisers.

Generally each small grower prepares the eggs for himself. At Tokyo they are beginning the practice of hibernation with refrigerators.

The white annual race, rather small, with elongated cocoons, is that which chiefly prevails. The double-moulting race tends to disappear. At the Institutes of Tokyo and Kyoto researches are being carried out on selection and crossing to obtain new races.

There are three broods in the year: spring, representing from 60 to 65 % of the whole; summer, 10 to 20 %, and autumn, 20-25 %.

The summer brood is decreasing, while that of the autumn tends to increase. The best quality is obtained from the spring brood.

The silkworms are generally kept very crowded. Great care is taken, but the management is not superior to that in North Italy.

Special buildings for schools and model silkworm nurseries have been constructed.

To combat the diseases of silkworms the Government has established 132 offices, employing 3 175 people. In spite of this the worms suffer much from " pébrine ", silkworm rot and " uji " (crossocosmia).

The annual production of cocoons amounts to 352 million lbs. at the present time, the average increase every year being about 22 million. The cocoon markets are held in the evening until midnight.

The cocoons are dried according to the systems of Takwan and Makabara. The old systems of reeling are called " Te-guri " and " Za-guri ". The industrial reeling in European fashion is done as in Italy but the spinning-machines have no beaters.

All the silk has to be unwound again after the reeling, owing to the damp climate which makes the threads stick at first. The spindle for re-reeling measures in diameter 54 cm. (21.3 in.) and in length 57 cm. (22.4 in.).

FISH.

HAAS, DR. **Carp Ponds Adjoining Slaughter Houses.** (Der Karpfenteich am Schlachthof). — *Allgemeine Fischerei-Zeitung*, 37. Jahrgang, Nr. 3, pp. 68-69. München, 1. Februar 1912. **548**

In the vicinity of the Offenburg slaughter house a carp pond was prepared in 1911 with a view to making use of slaughter-house offal. On the 12th May the pond was stocked with about 200 dappled carp two years old, averaging a weight of 250 to 374 grammes (8.8 to 13.2 oz.). In addition 80 tench were put in. For feeding, a mixture of blood, rye meal and a small proportion of boiled meat was used. The fish were fed 1-3 times a day according to the weather. They always ate the food greedily. **Germany**

On the 12th October 1911 the pond was emptied of fish. About 286.5 kg. (630 lb.) of carp and 2.5 kg. (5.5 lb.) of tench were saleable; 60 tench were put into a winter pond. The average gain in weight per carp was 1.250 kg. (2.75 lb.). The total proceeds obtained for the fish were M. 411.25 (£20.2*s* 9*d*); the expenditure of fish and rye meal amounted to M. 192.65 (£9.8*s* 6*d*) leaving a profit of M. 218.60 (£ 10.14*s*). The work was carried out by the existing staff without extra expense being involved. The blood and meat offal was supplied free of charge by the slaughter-house.

The carp were of excellent quality, so that fish breeding on this method is in every way to be recommended.

COLB. **The New Bavarian Law on Water Inspection and its Value from the Point of View of Fishing.** (Uber den Wert der Wasserschauen nach dem neuen Bayerischen Wassergesetz für die Fischerei interessenten). — *Allgemeine Fischerei-Zeitung*, 37. Jahrgang, No. 2, pp. 45. München, 10. Januar 1912. **549**

In Article 201 of the new Bavarian law in relation to waters, periodical inspections of water by specialists are provided for. The date of these inspections is published from time to time in the Official Gazette. **Germany**

The water inspection covers the entire condition of the river and the installations of every description erected on or along it.

It will further determine whether the conditions subject to which the emptying of refuse water is allowed have been complied with, and whether hydraulic installations have been unlawfully erected or modified.

Complaints may be made verbally to the Water Inspection Commission by those concerned, and will then be examined into on the spot.

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS.

550 CASTELLI, M. **Novelties of the Year in Agricultural Mechanics.** (Novità dell'annata nel campo della meccanica agraria). — *L'Italia Agricola, Almanacco per l'anno 1912*, pp. 128-137. Piacenza, 1911.

Italy

Mr. Castelli limits himself to noting those inventions of the year which concern the tillage of the soil, and which may be considered absolutely new, and he excludes all the improved apparatus, already existing and known in Italy, however important. He therefore only alludes to the constantly increasing use of well-known economic apparatus, with cable traction, like the Violati-Tescari, the Casali, and the Santachiara — machines which have been slightly modified and improved since last year. He devotes more space to the *Barford-Perkins* apparatus, which may be said to have established itself this year in the Roman Campagna (Palidoro).

This apparatus is more powerful and more complete than the preceding types. It is worked by a single engine, and for the pulleys adjustable by hand, which often cause serious difficulties in anchorage, anchor-trucks with automatic adjustment have been substituted. The windlass, on a four-wheeled truck, is worked by the engine by means of a chain. The connecting and disconnecting each of the drums can be done without stopping the motor. The use of a chain has made it possible to employ drums of large diameter,

(about 1 metre, or 5 ft. 3 in.; each capable of holding 800 metres, or 2600 ft., of cable of 15 mm. or 0.59 in.) and consequently cables consisting of a few thick strands; so that breakage by friction and rusting is less frequent. For working the apparatus five operators are required. This includes the transport of water for the motor. With a double share for deep ploughing the area ploughed over practically amounts to about two hectares (5 acres) a day, requiring, according to the nature of the soil, an engine of from 10 to 15 nominal H. P.

The writer then passes to traction steam ploughing, and after having mentioned the American tractor *Avery*, which has proved very satisfactory in the Roman Campagna, he describes a new type of steam tractor, suitable for medium-sized farms, where the fields are not very large, and the soil not too compact.

This tractor, constructed by Messrs Mc. Laren — a firm well known in the Piacentino for their powerful ploughing engines of 10 tons and more, gave excellent results when it was submitted to public trials last September on the Estate of the Bonafous Institute, near Turin. These trials, the results of which will be published in the report of the Minister of Agriculture on the competition in which this machine took part, have shown once more the practical importance of superheated steam on the consumption of fuel and water.

Also the multiple ploughs presented by the same firm were admired for the strength of the frame-work, and for the simplicity of the connection of the steering gear and of the automatic apparatus far raising the plough. (Ploughs with three shares that can be coupled for uneven land; with four shares, with or without subsoiling apparatus; and with six shares).

The *Tolotti-Pavesi* and the *Patuzzo* are two ploughing machines, with benzine motor, of an entirely new type, and constructed in Italy with remarkable originality of conception. From the technical standpoint they have given excellent results as regards the work done; while their economic advantage can only be discussed in each individual case.

The *Tolotti-Pavesi* is a three-wheeled automotor truck, to which the plough is rigidly fastened. The front wheel with steering gear is provided with a cutting disc; of the two back wheels, the right one is a motor, and its axle is fixed as regards the frame-work; while the left one simply carries, and equally with the steering wheel, it can be raised or lowered, by using the energy of the motor for the vertical adjustments.

The driver can therefore, from his seat, by simply working two levers, put the frame-work on a level, regulate the depth of the ploughing, and raise the working part of the machine.

Another characteristic of this apparatus is the motor wheel. It is placed so as to pass along the bottom of the furrow made by the plough, and provided with moveable blades, so as to obtain the necessary hold on the ground with little weight, and without excessive waste of energy.

The trial type of this plough weighs 950 kg. (2 100 lbs.) and has a benzine motor of 10 H. P.; the three shares work over a width of 0.70 metres (27.5 inches), at a depth that may be changed at will up to 20 cm. (8 inches); and it is obvious that the construction of lighter types would not be desirable, but that if the power of the motor were increased, and, in consequence, the speed (it is 0.90 m. or 3 ft. at present), the economic conditions of working it would also be somewhat improved.

The *Patuzzo* apparatus consists of an automotor truck, with plough attached, which is hauled by a cable stretched along the furrow and fastened at the ends. Instead of the single endless cable, or chain, as in the other types now given up, there are two cables partly wound on two drums which are carried by the apparatus, and each of which is fastened at one end of the furrow to be ploughed over.

This apparatus has the following advantages over the double windlass system with opposite anchor-trucks, or the simple return pulley: it avoids all dragging of the rope, and the consequent wear and tear and resistance; it allows a higher mean speed, and avoids the need of slowing down, signalling etc.; it requires for the same length of furrow less cable; anchorage is not so difficult; it is more suited for fields with trees; and it costs less.

It is superior to the system with two opposite windlasses in the following points: the dragging of the rope is avoided; the plant costs less, and less hands are required; the motor is utilised better, as the machine does full work both going and returning.

Both systems have the drawback of greater weight to be dragged along the furrows, and of the greater exposure of the motor and its connections to the action of dust.

Compared with the systems of direct traction, and those with no artificial arrangement for gripping the ground, the auto-towing system offers, or might offer, all the advantages that belong to lightness; for weight is not at all required for obtaining grip. The question of weight however does not seem to have been sufficiently considered. In fact in this case the weight supported by the wheels,

not counting the working part of the machine, is about 12 qls. (2 640 lbs.) that is, 120 to 150 kg. (264 to 330 lbs.) per H.P. (Motor of 8 to 10 H.P.), — not at all less than the weight of the direct tractors.

The mistake lies in having adopted too slow a speed (about 0.85 to 0.60 m., 2.8 to 2.0 ft., per sec.) with the consequent want of proportion between the power of the motor, the weight of the apparatus, and the ploughing section.

The electric ploughing apparatus from the firm of Siemens-Schuckert, on view at the Turin Exhibition, is also worth mentioning. It is well designed, specially as regards the electric part, and it is the first powerful two machine apparatus made in Italy for utilising the energy supplied by central hydro-electric stations, and transported by high tension current.

In competing with the steam ploughing apparatus with two machines, it is composed of two motor-windlass cars, two transformation cars, two moveable cables, apparatus for the high potential current, and the ploughing gear.

The windlass-car, whose outside dimensions are 22×8.5×10 ft. (height), carries a three-phase motor of 60 kilowatts, the manipulation, control, safety, and resistance apparatus, the cable, the transmission-shafts, and the drum with horizontal shaft parallel to the carrying shafts, and capable of winding 500 metres (550 yards) of cable.

The transmission from the motor to the first counter-shaft is by a belt; thence to the second counter-shaft with change of velocity, and from the second to the drum, it is by cog-wheels.

The two normal speeds transmitted to the plough are 0.90 m. (3 ft.) and 1.60 m. (5.3 ft.) per second. Those transmitted to the back wheels, for moving the truck, are 0.24 m. (0.8 ft.) and 0.40 m. (1.3 ft.). By changing the pulleys on the motor, it is possible to obtain a speed of from 1.30 to 2.10 m. (4.3 to 7 ft.) per second for the traction cable, and from 0.33 to 0.50 m. (1.1 to 1.7 ft.) for the truck. The motor itself is fixed to a carriage running on guides; an automatic interrupter protects the motor from abnormal obstacles (stones, roots etc.); while to prevent mistakes in management, the moveable cable cannot be connected except when the interrupter is open, nor disconnected except when the current is off.

The transformation cars are used to reduce the tension of the main line from several thousand volts (5000 to 15 000) to 500 to 1000. The truck for 10 000 volts and 70 kilowatts weighs three tons.

551 **Lister Drill and Lister Cultivator.** — See above, No. 490.

552 CONDÉ, F. DE. **Trials of Jerusalem Artichoke Diggers at Montmorillon.** (Les Arracheurs de Topinambours aux essais de Montmorillon). — *Journal d'Agriculture pratique*, 76e Année, T. I, No. 2, pp. 57-58. Paris, 11 Janvier 1912.

France

The labour required for digging Jerusalem artichokes by hand is becoming more and more rare in the Department of Vienne, and the Poitevine Society for the Encouragement of Agriculture has just organised trials of mechanical diggers at Montmorillon. These trials took place on Dec. 24th 1911 in a loam soil which represents the average type of that district.

Ten machines, which can be divided into three categories, took part in the trials.

1) Machines like potato-ploughs; these are the most simple; the machine is set in at the end of the ridge, and the tubers are thrown to the sides; two handles are used for steering. Three such machines were shown.

2) Machines with rotatory forks. The digger, which has two wheels, carries at the back a disc (or a star) at right angles to the direction of progress; this disc has forks round it and has a rotatory movement; in front of the forks, a share cuts through the earth below the tubers; the forks in succession, throw up the earth, so that the tubers fall to the side of the machine. In some of the machines the tubers are thrown against a wire-screen to free them from the soil.

These different machines possess, according to their constructors, a seat, handles, levers to regulate the depth, etc. Six of this kind were shown.

3) A digger with a fore-carriage consisting of a share with openwork mould-board, behind which is an axis furnished with projecting pins; this revolves rapidly and breaks up the soil raised by the share, throwing the tubers to one side.

All the machines worked well.

The advantage of the potato-plough type of digger is its low cost, simplicity and strength.

The cheapness and strength of the machine are important matters, seeing that the artichokes are only dug up in small quantities, either every day, or every two days according as they are required. (The tubers keep well exposed in the field, and can with-

stand temperatures of — 16° C. and — 18° C., *i.e.* 29 to 32° F. of frost).

The machines with revolving forks are most efficacious, but their high price makes them inaccessible to many growers.

The varieties which answer best with diggers are those in which the tubers grow in clumps at the base of the stalk.

Thus the red kind of Jerusalem artichoke is to be preferred to the yellow.

GÜNTHART, ALOIS. **Canvas Hose for the Conveyance of Liquid Manure.** (Der Segeltuchschlauch als Transpordmittel flüssiger Dünger). — *Wiener Landwirtschaftliche Zeitung*, 62. Jahrgang, Nr. 5, p. 47. Wien, 12. Januar 1912. 553

Germany: Bavaria

For several years, in Allgau in Bavaria, canvas hose of about 8 cm. (3.2 inches) diameter has been used to convey liquid manure to the fields. The several sections of hose should not exceed 8 m. (26 feet) in length. They are suitably connected up by means of a bayonet joint which can be readily detached. The hose is impregnated with antiseptic substances by the manufacturer and lasts 4 years, if, each time after use, it is washed and then hung up in a dry room. The price, together with joints, amounts to about fr. 0.80 per metre run (about 2 ½ *d* per lineal foot). The use of the hose will only present advantages where the land to be manured is not too far from the manure tank; there should also be a natural slope available. If this is wanting, the deficiency may be made good by pumping the manure into a higher tank and running it into the field from there. (1)

The hose is used as follows: The liquid manure is run out of the tank into a trough, fitted with an outflow pipe and cock. This pipe must be about 25 cm. (10 inches) above the bottom of the trough, to enable sand and mud to settle and avoid getting it into the hose. A sufficient number of lengths of hose are connected together to reach from the trough to the farthest end of the land to be manured. A workman at the end of the hose waters a strip of about 10 m. (about 33 feet) with the liquid; after sufficiently manuring a piece of land, he detaches one hose length after the

(1) In Switzerland an electrically driven centrifugal pump has been successfully used in direct combination with canvas hose, for conveying liquid manure. The elevated tank is then unnecessary. (*Ed.*).

other, allowing it to lie on the ground for the moment, and continues manuring through the shortened hose. In this way the end of the plot of land lying nearest the tank is reached and the whole strip 10 metres wide will have been watered.

The cock is now shut off, the lengths of hose connected up again, and then a fresh strip manured as above.

The hose may also be advantageously used in conjunction with the manure cart for pieces of land which are very steep. The cart remains at an elevated point of the land, the hose is fastened to the spigot of the barrel containing the manure, and the latter then distributed in the way above described.

The advantages of this method are:

1. Rapid work.
2. Teams are not needed.
3. The distribution of the manure is the best imaginable, especially if water is added.
4. In rainy weather the greensward is not injured by carts and draft animals.

554 RINGELMANN, MAX. **Motor Vans.** (Camions automobiles). — *Journal d'Agriculture pratique,* 76e Année, Tome I, No. 3, pp. 86-87. Paris, 18 Janvier 1912.

The Minister of War organised at Versailles from July 18 to Aug. 11, 1911, a trial competition of motor vans.

France

There were two classes: the motor vans properly so called, and the traction engines.

1. *The Motor Vans.* — The conditions were:

Maximum weight empty	7 150 lbs.
Maximum load per axle	8 860 »
Ratio of the load to the total weight, at least	45 %
Mean speed, per hour	7.5 miles
Maximum speed, per hour	15.5 »
Minimum speed, on an incline of 12 %, per hour	2.5 »

The vans both loaded and unloaded were required to move in a regular line at an average speed of 7 ½ miles per hour.

At the following base prices:

Oil	2s 2 ½d per gal.
Grease.	4 ¼d » lb.
Distillate	1s 3d » gal.
Benzol	10d » »
Carburetted Alcohol.	1s 4 ½d » »

the mean cost of combustible, oil and grease per ton of useful load per mile might not exceed 1.24 *d* for rubber-tyred vehicles, or 1.56 *d* for others.

The course was arranged on roads radiating from Versailles, and totalled 1 570 miles; the daily stages were from 51 to 67 miles.

On the first nine stages the engines were to use distillate, on the next four carburetted alcohol, and on the last nine benzol.

Four stages were made without a load.

For the 38 vans submitted to the trial the price per load-ton per mile varied from 0.45 *d* to 0.98 *d*.

The following table gives the details of those machines only in which this figure was below 0.54 *d*. To these prices should be added the chauffeur's wages, and the fixed rates for amortisement, interest and upkeep of the machine.

Vehicle —	Weight of empty vehicle tons	Load tons	Weight on rear axle tons	Cost per mile-vehicle pence	Cost per load-ton per mile pence
De Dion-Bouton	3.06	3.42	4.30	1.54	0.45
» »	3.03	3.45	4.21	1.62	0.47
Desmarais and Morane .	2.53	2.35	3.50	1.13	0.48
Peugeot	2.76	2.30	3.46	1.13	0.48
Desmarais and Morane .	2.53	2.37	3.54	1.18	0.50
» » . .	2.30	2.11	3.19	1.08	0.51
Clément-Bayard	2.64	2.51	3.54	1.36	0.53
» »	2.59	2.50	3.45	1.39	0.54

2. *The Traction Engines.* — The conditions were:

Maximum weight empty.	12 320 lbs.
Maximum load per axle	11 000 »
Ratio of the load to total weight at least.	30 %

The engine, loaded so as to have a total maximum weight of 17 600 lbs. was required to draw a total weight of 15 400 lbs. The car weighed 4 400 lbs. and its load 11 000 lbs.

The vehicles were required to climb ascents of 8 % on wet or muddy roads, and 10 % on roads in good condition.

The mean speed of an engine loaded and drawing a total weight of 15 400 lbs. was to be at least 5 miles an hour.

Six traction-engines were submitted to all tests over a total course of 1 255 miles, and the cost of conveying one ton load the distance of one mile varied from 1.06 *d* to 2.61 *d*.

The following are the figures relating to two Saurer traction-engines:

	I	II
Weight of tractor empty	3.84 tons	3.82 tons
Load	2.95 »	2.95 »
Weight on hind axle	4.92 »	4.90 »
Cost per vehicle-mile	3.15 *d*	3.23 *d*
Cost per load-ton per mile	1.06 *d*	1.09 *d*

Taking account of the fact that the load drawn was 11 000 lbs.; the price representing the transport of one ton for one mile for the whole load (carried and drawn) of 17 600 lbs. works out at 0.40 *d* for the first tractor and 0.41 *d* for the second.

Sixteen vans and three traction engines, all of them with oil motors, were awarded prizes; the steam machines, despite the favourable conditions accorded them, failed; and this failure is chiefly due to their limited fuel and water capacity.

BUILDING-CONSTRUCTION.

555 **Hygienic Cow-Sheds and their Construction.**

ROLET, ANTONIN. L'étable hygiénique. — *L'industrie laitière*, 37e Année, No. 2, pp. 17-21. Paris, 14 Janvier 1912.

RAINERI, LUIGI. Ricoveri per gli animali. — *L'Italia Agricola*, Anno XLIX, No. 1, pp. 11-14. Piacenza, 15 Gennaio 1912.

DE LINDE, PETER. Restoration of the Cement Art (Concrete Barn Floors). *The Missouri and Kansas Farmer*, Vol. XXVIII, No. 8, pp. 159-163. Kansas City, Dec. 15, 1911.

The contents of these three articles are summarized under the 11 following headings.

France. Italy. United States

1 *Site.* — Choose a dry well-drained spot, a little elevated, on a slope, and where a sufficient supply of pure water can be obtained.

Isolate the cow-shed from the other buildings, in order to avoid risks of fire, and infection of the milk in case of illness among the staff.

2. *Exposure.* In temperate districts, the chief frontage should face east or west, and in cold districts it should look south.

3. *Walls.* For reasons of cleanliness, the inner angles of the walls should be rounded; the walls themselves should be smooth to give no hold to dust, insects and microbes, and to prevent their impregnation with ammonium carbonate, which imparts its odour to the milk. The base of the walls should be cemented to a height of 1.75 metres (5 ft. 9 in.) from the ground.

The bottom of the doors and of the wood-work (except the partitions between the stalls if present) should receive a coat of impermeable paint in order to facilitate washing. To the remainder of the walls should be applied, as a spray, milk of lime with the addition of an antiseptic (bisulphite) (1); two applications a year are necessary, in order to kill pupae of insects.

4. *Floor.* A floor of simple trodden earth suits the animals well; but it is permeable, difficult to wash, and forms cavities.

Wood, macadam, Portland cement, asphalt, paving formed of round pebbles are not to be recommended.

The best materials are flags or stone bricks fixed edge-ways, pointed with cement or, for the sake of economy, laid flat on a layer of sand; a kind of hydraulic cement on a layer of broken stones, without interstices, or 8 cm. (3 in) of coarse concrete, covered by 5 cm. (2 in) of coke or asphalt (isolating) and the whole finished by a layer of cement. A slope of 1 to 1 ½ % is enough; a greater slope fatigues the animals. The urine channel should have a fall of 2 to 3%, a width of 30-45 centimeters (12-18 in) and a depth of 5-10 cm. (2-4 in) according to the kind of form selected.

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(1) A solution of sulphate of copper may be added to the milk of lime, as its antiseptic action is more marked than that of the sulphur dioxide produced from bisulphites.

Sulphate of copper in ½ per cent solution kills the typhoid fever bacillus, at 2 per 1000 it destroys the cholera bacillus, and at 1 per 1000 it deodorizes and sterilizes sewage water.

On the contrary the fumes of burning sulphur (sulphurous anhydride) do not kill any spores and their effect upon bacilli is nil unless they are highly concentrated and their action is continued for 2 or 3 hours (UGO BARPI *Abitazioni degli animali domestici*, Milano, 1897). (*Ed.*).

A deep trench can also be dug and covered with a piece of perforated sheet-iron. In order to prevent the escape of gas from the manure-pit a siphon or a bung with a hydraulic stopper should be affixed to the end of the pipe.

5. *Ceiling*. This is best made of incombustible material and should be smooth to avoid the lodging of dirt; it might be of reinforced concrete supported by small iron beams. Below the latter are fixed gutters to catch the drops caused by the condensation of the damp upon metal.

6. *Doors, windows ventilating shafts* (ventilation, aeration, light, temperature).

There should be one door in the centre of the front of the building, for a door at either end would give rise to injurious draughts.

The windows must be placed on the side least exposed to cold winds, or those coming from the rainy quarter. The windows should be glazed, or of reinforced concrete; if the former kind are chosen shutters or blinds are necessary to reduce the brilliance of the light, if the latter, a small glazed sash is introduced to give light to the interior of the cow-shad. Windows of reinforced concrete, if solidly made (sufficient metal being introduced) are capable of resisting even violent shocks.

Ventilation will be insured by the presence not only of the windows, but also of other openings sometimes made 30 cm. (12 in) below the ceiling (which can be closed at will by wooden or straw plugs) and further by shafts for ventilation, at the rate of one for ten cows. The inlet ventilating shafts may open at different points in the floor, in the passages. In winter they have the advantage of warming the outer air before entering the cow-shed. Care must be taken that the draughts do not catch the cows' udders.

Ventilation is difficult when there are more than ten animals in the shed. When their number reaches thirty, forty, or fifty, the air becomes too damp; it is charged with breathed air or exhalations from the skin, and during feeding, when gaseous exchange is considerably slower, the cows have a tendency to asphyxiation.

The animals like semi-darkness, which lends itself to rumination. Too much light diminishes the lactic secretion, and it is best that the light in a cow shed should be always subdued, but sufficiently bright to allow the various operations — milking and cleaning — to be carried out.

According to Ringelmann, the aperture of the windows should be calculated on the basis of $\frac{1}{3}$ m. (3.6 sq. ft.) of surface per

animal, but large sheds need more light in proportion than do small ones. According as to whether the cows are accustomed to the open air, or are stall-fed, the temperature should be maintained at 12° C or 15° C. With too low a temperature the animals eat more forage.

7. *Internal arrangements and dimensions*. The amount of air allowed to each cow should be at least 20 m.³ (706.34 cub. ft.).

The minimum width of space to be reserved for each should be, according to the Seine council of Hygiene (France), 1.45 m. (4 ft. 8 in.). The Health Council of the Département du Nord (France) considers that 1.30 m. (4 ft. 2 in.) is sufficient, provided the building can be aired at will.

The height of the ceiling should be at most 3.50 m. (11 ft. 4 in.) in cases where the width is limited to 4 m. (13 ft.). Each shed should shelter 20 animals at most, for fear of propagating disease, and also in order that the cows may not be disturbed for solong by the operations of cleaning down and milking.

8. *Feeding troughs*. Cattle like their food placed near the ground, racks are therefore useless.

Separate troughs are to be preferred to common ones, for fear of contagion. The average capacity of these receptacles should be 150 litres (5.3 cub. ft.) the bottom 45 cm. (18 in.), the top 50-60 cm. (20 in. — 24 in), depth. 25 — 30 cm. (10 — 12 in.).

The trough rests on masonry, and can be entirely of reinforced concrete; the bottom is arched and the upper edge 70 — 60 cm. (24 — 28 in) above the ground. To prevent the fodder falling on to the ground, and thus being wasted, the animals are separated from the troughs by railings through which they pull their food. To avoid any injury while feeding, the uprights of these railings are moveable on their axes.

9. *Litter* Some writers object to peat, saw dust, and tan, because they get sodden and make the cows dirty. Peat possesses great properties of absorbing bad smalls, and can be used, if straw is laid down over it. If straw alone is used, 3 to 6 kg. (6.6 — 13.2 lb.) per head is required. The manure should be removed, if not every day, at least three times a weck. The stalls must be washed and sprinkled with water containing some antiseptic.

10. *Water*. The shed must be provided with water under pressure. In summer, it may be necessary to water the floor in order to keep the air at the right degree of moisture.

11. *Lighting*. This can be effected at night by "marine" oil lamps (oil gives off less disagreable odours than petroleum). The round glass of these lamps is surrounded with wire; they are

suspended by a cord which passes over a pulley fixed in the ceiling. Electricity can also be used with advantage.

"L'Italia Agricola" gives a description of a model cow-shed in the Province of Piacenza. The windows, one for every two cows, are of reinforced concrete. The roof projects far beyond the outer walls and affords a shelter for the hay waggons; it also protects the base of the shed from the sun. The article is illustrated by figures giving the elevation, and two sections, transverse and longitudinal, of the building, showing the details of its construction.

RURAL ECONOMICS.

556 **Data on the Rents that are now being paid for Land in Italy.** Raccolta dei canoni di affitto che sono pagati attualmente in Italia). — *Collected by the Bureau of Agricultural Intelligence and of Plant Diseases.*

Italy

The figures given below are quite recent, with the exception of those taken from the Parliamentary Enquiry into the conditions of the Peasantry in the South of Italy and in Sicily.

The taxes are always paid by the owner of the land, save in those cases especially mentioned.

Piedmont.

Province of Turin. Lands adapted to ordinary crops:

From 105 to 210 fr. per hectare (£1. 13*s* 7*d* to £3. 7*s* 2*d* per acre) according to the locality, exposure, nature of the soil and subsoil, and irrigation.

For land suitable for market gardens the rent is from 183 to 341 fr. per ha (£2. 18*s* 7*d* to £5. 9*s* 1*d* per acre).

Province of Novara, district of Vercelli. — For average sized farms on soil of medium fertility and provided with water the rent is about 250 fr. per ha. (£4 per acre).

On the best soils both for fertility and other favourable conditions, the rent is from 240 to 250 fr. per ha (£3. 16*s* 9*d* to £4

per acre) for large farms, whilst for medium sized and small ones it rises to 280 fr. (£4. 9*s* 7*d* per ac.). On poorer soil the average is about 200 fr. (£3. 4*s* per ac.).

Province of Cuneo. — The rent for lands of the various classes is as follows:

1.st class	180 to 260 fr. per ha	(£2. 17*s* 7*d* to £4. 3*s* 2*d*	per acre).
2.nd »	140 to 180 » » »	(£2. 4*s* 9*d* to £2. 17*s* 7*d*	» »)
3.rd »	100 to 140 » » »	(£1. 12*s* to £2. 4*s* 9*d*	» »)
4.th »	80 to 100 » » »	(£1. 5*s* 7*d* to £1. 12*s*	» »)

Province of Alessandria. — In the district of Alessandria the rents given below refer to arable lands and meadows in the plains, and to vineyards on the hills.

The lease is usually for vineyards and the rents are the following:

Alluvial soils in the Tanaro valley, 150 to 170 fr. per ha (£2. 8*s* to £2. 14*s* 5*d* per acre).

Heavy soils on the plateaux 130 to 140 fr. per ha (£2. 1*s* 7*d* to £2. 4*s* 9*d* per acre).

Gravelly soils of the Fraschea, or the plateau between the Orta, the Bormida and the Tanaro, about 120 fr. (38*s* 5*d* per acre).

Vineyards: either 160 to 170 fr. per ha (£2. 11*s* 2*d* to £ 2.14*s* 5*d* per acre) or the produce is divided between the owner and the farmer: two thirds of the grapes and one half of the other crops being taken by the farmer and the rest by the owner. This agreement, however, is really more a form of metayage, or working on shares, than renting.

LIGURIA.

In the plains of Sestri Ponente as far as Rapallo, and on the other side as far as Porto Maurizio, the rent paid for good irrigable land is from 400 to 600 fr. per ha (£6. 8*s* to £9. 12*s* per ac.).

On the low lands of the western Riviera the rent of farms suitable for market garden produce or early flowers rises to 1000 and 1200 fr. per ha (£16 to £19 .4*s* per ac.).

In the hills where the olive is cultivated, farms having some level grass-land, a certain extent of wood and a house, let for 200 to 300 fr. per ha (£3. 4*s* to £4. 16*s* per ac.).

Very often these peasant farmers pay high rents for farms situated near factories, in which the able bodied members of their families find employment, while the women and the less robust

attend to the cultivation of the land and the retail sale of its produce.

On the mountains and in the valleys where the olive is not grown and the vine is poor or does not thrive at all, and where the soil is never very fertile, the total yearly rent of a farm consisting of a house, about 2 ½ acres of cultivated land, 25 to 30 ha (62 to 74 acres) of stony pastures enough for two or three cows, and some little hay, besides 10 or 12 ha (25 to 30 acres) of wooded surface for the necessary fuel and litter, amounts to 150 to 250 fr. (£6 to £10).

There are also farms suitable for flower gardens; they are about 5000 to 7000 sq. metres (1 ¼ to 1 ¾ ac.) in extent, and with a house and stable are let for 600 to 1000 fr. (£ 24 to £ 40).

In good hill lands, farms consisting of a house, a stable and little over a hectare (2.47 ac.) of land under trees and vines command a rent of 800 to 1200 fr. per ha (£12. 16*s* to £19. 4*s* per acre).

LOMBARDY.

Milan. — The territory of the Province of Milan is divided into two parts: the upper and the lower. They are distinguished by the different nature of the soil and of the crops.

In the upper part there are two types of tenure: in one, called also metayage, the owner gets one half of the silk cocoons and of the wheat produced; altogether from 10 to 14 fr. per Milanese perch (654.5 sq. met.) or 152.70 to 213.90 fr. per ha. (£2. 8*s* 10*d* to £3. 8*s* 2*d* per ac.).

In the other, called "affitto a grano", rent in wheat, the owner is paid 122 to 229 fr. per ha. (£1. 19*s* to £3. 13*s* 3*d* per ac.).

In the lower part of the province the average rent is 152.70 to 221 fr. per ha (£2. 8*s* 10*d* to £3. 10*s* 8*d* per ac.) with an absolute minimum of 122 fr. per ha. (£1. 19*s* per ac.) and a maximum of 305·60 fr. per ha (£ 4.17*s* 9*d* per ac.).

VENETIA.

Venice. — For large estates, the rent varies from 150 to 200 fr. per ha. (£2. 8*s* to £3. 4*s* per ac.). Farms up to 50 hectares (123 ½ acres) are rented at about 250 fr. per ha (£4 per ac.). Smaller lots, with house and enclosure, fetch 300 to 350 fr. per ha (£4. 16*s* to £5. 12*s* per ac.). The rent of low-lying lands, not completely reclaimed and liable to inundations is considerably less.

Polesine.

Rovigo. — Rents vary from a minimum of 100 fr. per ha (£1. 12*s* per ac.) for the sandy soils which suffer severely from the summer drought, to a maximum of 350 fr. (£5. 12*s*) for the best lands especially in the upper Polesine.

Emilia.

Bologna. — The fertile plains near Bologna, planted with trees and vines, and adapted to the production of hemp, are let, on average, at 250 fr. per ha (£4 per ac.); those somewhat more distant from the city at about 200 fr. (£3. 4*s* per ac.). Clay lands of middling fertility are rented at about 150 fr. per ha. (£2 8*s*).

In the province, good flat land is let at 150 to 160 fr per ha (£2. 8*s* to £2. 11s 2*d* per ac.).

Good soils in the hills near Bologna, excepting those under special fruit crops, are paid 150 to 200 fr. per ha (£2 8*s* to £3.4*s* per ac.); those further off only 100 fr. (£ 1.12*s* per ac.).

Market gardens around the city are let for 500 fr. (£ 8 per ac.) and upwards per ha.

Ravenna. — The lands in the belt called « delle larghe » are excellent, but without buildings; they are rented at 150 to 180 fr. per ha (£2. 8*s* to 2.17*s* 7*d* per ac.). Metayer farms of medium fertility and provided with buildings and plantations can be leased for 180 to 200 fr. per ha (£2. 17*s* 7*d* to £3. 4*s* per ac.).

In the vine growing part (Bagnocavallo, Russi, Fusignano) rents rise to 220 to 300 fr. (£ 3.10*s* 5*d* to £ 4.16*s* per ac.) and still higher for farms near the city.

Rimini. — Land is but rarely rented. Arable lands planted with rows of vines in the plain or on the lower hills are let for about 100 fr. per ha (£ 1.12*s* per ac.). Rents show a tendency to rise.

Tuscany.

Maremma about Grosseto. — In the plain the average rent is between 50 and 75 fr. per ha (16*s* and 24*s* per ac.). Large estates in the plain or on the hills, about 50 fr. (16*s* per ac.) but sometimes even less. Even as low as 20 fr. (6*s* 5*d* per ac.) is paid for very large estates with olive trees, etc.

Province of Pisa. — In Tuscany, with the exception of the Maremma, it is not customary to rent land, owing to the prevalence of the metayer system; nevertheless here and there limited areas are sometimes let, and in some cases whole estates.

In the province of Pisa, small farms of ½, 1 or at most 2 hectares (1 ¼, 2 ½ or 5 acres), buildings not included, cultivated by the lessee himself, can be had for the following rentals:

Clay lands without vines on them, 120 to 130 fr. per ha (£1. 18*s* 5*d* to £ 2.1*s* 7*d* per ac.).
Middling fertile arable loams and with rows of vines on them, 200 to 250 fr. (£3. 4*s* to £4 per ac.).
The best arable soils, with rows of vines on them, 270 to 360 fr. (£4. 6*s* 5*d* to £5. 15*s* 2*d* per ac.).

In the plain of Navacchio and of Cascina where the soil is very fertile and cultivation is intensive: market gardening on a large scale (cabbages, potatoes, artichokes), the rent varies from 396 to 414 fr. per ha (£6. 6*s* 8*d* to £6. 12*s* 6*d* per ac.).

If several farms or whole estates of no great extent are let, the following are the usual rents:

Clay lands without rows of vines, 100 to 120 fr. per ha (£1. 12*s* to £1. 18*s* 5*d* per ac.).
Medium fertile arable loams with vine rows, 150 to 180 fr. per ha (£2. 8*s* to £ 2.17*s* 7*d* per ac.).
The best arable lands with vine rows, 200 to 220 fr. per ha (£3. 4*s* to £3. 10*s* 5*d* per ac.).

Generally the lessee buys the livestock, and is debited with the amount of the other accessory stock of the farm, such as hay, straw, machinery, etc. At the end of the lease he is paid for the live stock he leaves, and is credited with the amount of accessories he returns to the lessor, the difference, if there is any, being settled by a cash payment.

The meadows near the city of Pisa are let for about 108 fr. per ha (£1. 14*s* 7*d* per ac.).

In the hills rents are somewhat lower.

Province of Lucca. — In this province land is not usually rented. In Versilia, the part of the province lying on the sea coast, the sandy non-irrigable soils are let at from 130 to 160 fr. per ha (£2. 1*s* 7*d* to £2. 11*s* 2*d* per ac.). Sandy irrigable low lying lands let for 150 to 190 fr. per ha (£2. 8*s* to £3. 0*s* 9*d* per ac.).

The medium compact soils of Camaiore and Seravezza command the same prices.

In the irrigated plain of Lucca the rent is paid in kind, and corresponds to 240 to 320 fr. per ha (£4 to £5.2*s* 5*d* per ac.)

but there is a marked tendency towards a fall in rent owing to emigration.

On the hills about Lucca in the Serchio valley and in Valdinievole rents range from 200 to 220 fr. per ha (£3. 4*s* to £3. 10*s* 5*d* per ac.); there are some lands along the river Pescia used as market gardens and nurseries which fetch as much as 700 to 1000 fr. per ha (£11. 4*s* to £16 per ac.).

Marches.

Province of Macerata. — For average sized farms the rent varies from 80 to 115 fr. per ha (£1. 5*s* 7*d* to £1. 16*s* 10*d*) according to the fertility of the soil.

Province of Ancona. — In large estates in the hills, the rent is 70 to 80 fr. per ha (£1. 2*s* 5*d* to £1. 5*s* 7*d* per ac.); in medium sized ones 90 to 100 fr. (£1. 8*s* 9*d* to £1. 12*s* per ac.), and in small ones 110 to 120 fr. per ha (£1. 15*s* 2*d* to £1. 18*s* 5*d* per ac.).

In the plains 120 to 140 fr. per ha (£1. 18*s* 5*d* to £2. 4*s* 9*d* per ac.) is an average rent.

Market gardens near towns, if well provided with water, fetch 200 to 250 fr. (£3. 4*s* to £4 per ac.).

Umbria.

Flat land without vines or trees, average 100 fr. (£1. 12*s*).
Hill lands » » » » 75 » (£1. 4*s*).
Oliveyards, 150 to 180 fr. (£2. 8*s* to £2. 17*s* 7*d*).
Flat land with vines in rows, 125 fr. (£2).
Vineyards . . . . somewhat less.

Latium.

In the *Agro romano*, the rent for fairly large estates without vines or trees varies from 50 to 80 fr. per ha (16*s* to 25*s* 7*d* per ac.) according to the nature and fertility of the soil, and the distance of the property from Rome.

In the neighbourhood of Frosinone the following are average rents:

Poor soils.	45 fr. par ha	(14*s* 5*d* per acre,
Medium fertile . . .	55 » » »	(17*s* 7*d* » »)
Fertile	80 » » »	(25*s* 7*d* » »)

Small lots of ½ to 1 ½ ha (1.2 to 3.6 acres) are let at 50 to 90 fr. per ha (16*s* to 28*s* 9*d* per ac.).

ABRUZZI AND MOLISE.

(From the Parliamentary Enquiry into the Conditions of the Peasantry in the South of Italy and in Sicily, Vol. II, T. I. — Report of Dr. Jarach).

Communes in the valley of the Aterno, Fossa Paganica, S. Demetrio:

The poorest lands in the plain, 88 to 96 fr. per ha (28*s* 2*d* to 30*s* 8*d* per acre).

The best lands, 224 to 240 fr. per ha (£3. 11*s* 8*d* to £3. 16*s* 8*d* per ac.).

These prices are for small lots in which potatoes, maize and pulse are grown.

In the Abruzzi the custom of renting land is common. Rents vary to a great extent.

CAMPANIA.

Province of Naples. — The highest rents for the best irrigable lands for market gardens near Naples range from 850 to 900 fr. per ha (£13. 12*s* to £14. 8*s* per ac.) and exceptionally attain 1000 fr. (£16).

In the rest of the province the same lands fetch from 450-650 to 700 fr. per ha (£7. 4*s*, £10. 8*s* to £11. 4*s* per ac.) according to the supply of water.

Other parts of Campania (Bordiga): *Plain of Fondi*: good lands 84 to 90 fr. (26*s* 10*d* to 28*s* 9*d* per ac.).

Sessa Aurunca: Small holdings of 1 ½ ha (3 ¾ acres) are let at 90 to 120 fr. per ha (28*s* 9*d* to 38*s* 5*d* per acre).

Lower Volturno valley: The best arable lands 150 fr. (£2. 8*s* per ac.). Arable lands planted with vines 170 to 190 fr. (£2. 14*s* 5*d* to £3. 0*s* 9*d* per ac.).

Sparanise and Teano: Arable lands, planted with olives 80 to 90 fr. (25*s* 7*d* to 28*s* 9*d*) and 100 to 120 fr. (32*s* to 38*s* 5*d* per ac.).

Plain of Eboli: Farms, partly irrigated, and provided with buildings, 150 to 160 fr. per ha (£2. 8*s* to £2. 11*s* 2*d* per ac.).

Arable lands: poor and stony, 66 fr. (21*s* 1*d* per ac.), with pastures and woods 33 to 50 fr. (10*s* 7*d* to 16*s* per ac.), good arable lands 15 fr. (£ 2.8*s* per ac.).

Hill and mountain land for extensive cultivation, in the neighbourhood of Ariano and S. Angelo dei Lombardi 20-30-50-60 fr. per ha (6*s* 4*d*,9*s* 7*d*,16*s*,19*s* 2*d* per ac.) according to situation and fertility

The best pastures in the Matese district: 60 to 70 fr. (19*s* 2*d* to 22*s* 5*d* per ac.); ordinary pastures 25 to 30 fr. (8*s* to 9*s* 7*d* per ac.) and even less.

First class hemp soils (Casoria, S. Pietro a Patierno, Caivano, Afragola, etc., are let at 400 to 500 fr. (£6. 8*s* to £8 per ac.), second class hemp soils (Maddaloni, Caserta, S. Maria di Capua, Aversa, Acerra, etc.) 300 to 400 fr. (£4. 16*s* to £6. 8*s* per ac.).

In the drier lands, such as the lowest slopes of Vesuvius, the rents sink to 220 to 280 fr. (£3. 10*s* 5*d* to £4. 9*s* 7*d* per ac.).

In the Avellino district, the best arable lands inter-planted with vines and fruit trees are rented at 220 to 250 fr. (£3. 10*s* 5*d* to £4 per ac.); on the hills, in the environs of Ariano, S. Angelo and Beneventano, rents fall to 180-150-130 fr. (£2. 17*s* 7*d*—£2. 8*s*—£2. 1*s* 7*d*).

The irrigable arable lands of Scafati, Angri, Poggiomarino, etc. are let at 250 to 450 fr. per ha (£4 to £7. 4*s* per ac.).

The rents of vineyards vary within wide limits, from 80 to 200 fr. (25*s* 7*d* to £3. 4*s* per ac.) in the environs of Ariano, S. Bartolomeo, Campagna, etc. up to 450-500 fr. (£7. 4*s* to £8 per ac.) in Ischia and at Pozzuoli.

Orchards on the slopes of Vesuvius are let at 300 fr. per ha (£4 16*s* per ac.), if under citrus fruits 425 to 450 fr. (£6. 16*s* to £7. 4*s* per ac.).

Province of Salerno: On the Amalfi coast the rent paid for small patches under citrus fruits reaches 1500 to 2500 fr. per ha (£24 to £40 per ac.) and upwards.

About Nocera small areas especially used for market gardens are paid 600 to 700 fr. per ha per annum (£9. 12*s* to £11. 4*s* per ac.).

Where tobacco is grown, as near Cava de' Tirreni etc., and about Mercato S. Severino, where vines, potatoes, tomatos, onions and maize are grown, rents range from 400 to 600 fr. (£6. 8*s* to £9. 12*s* per ac.).

In the plains of Battipaglia, the rent for farms of 100 to 200 ha (250 to 500 acres) is 150 to 200 fr. per ha (£2. 8*s* to £3. 4*s* per ac.) and reaches 250 fr. (£4 per ac.) for smaller and irrigable farms.

In other parts of the province, in the hills or on the mountains where there is much emigration and the soil is not very fertile, rents range from 50 to 150 fr. per ha (16*s* to £2.8*s* per ac.).

BASILICATA.

Western or mountainous part (from the Parliamentary Enquiry into the Conditions of the Peasantry in the southern provinces of Italy and in Sicily, Vol. V, T. I. Report of Prof. E. Azimonti).

Commune of Anzi, lands partly arable and partly pastures and woods, 11.32 to 35 fr. per ha (3*s* 7*d* to 11*s* 2*d* per ac.).

Commune of Pietrapertosa, Woods of Montepiano: 5 to 8 fr. (1*s* 7*d* to 2*s* 7*d* per ac.).

Commune of Laurenzana, pasture in the woodlands 0.94 fr. (3*s* 6*d* per acre).

Commune of S. Severino Lucano, pastures 2 fr. per ha (8*d* per ac.).

Congregazione di Carità of Moliterno, arable lands 17 to 20 fr. per ha (5*s* 5*d* to 6*s* 5*d* per ac.).

APULIA.

Province of Bari: The rents of market gardens at Bari vary from 250 to 500 fr. per ha (£4 to £8 per acre).

Province of Foggia:

Lands near the town, 81 to 94 fr. per ha (25*s* 11*d* to 30*s* 1*d*).
Lands at a distance from town, 61 to 77 fr. per ha (19*s* 6*d* to 24*s* 8*d*).
Dry calcareous soils, 45 to 61 fr. per ha (14*s* 5*d* to 19*s* 6*d*).
Good pastures, 16 to 24 fr. per ha (5*s* 1*d* to 7*s* 8*d*).
Very good pastures, 40 to 49 fr. per ha (12*s* 9*d* to 15*s* 8*d*)

SICILY.

(From the Parliamentary Enquiry into the Conditions of the Peasantry in the Southern Provinces of Italy and Sicily, Vol. II, T. I. Report of Prof. G. Lorenzoni).

Arable and grazing lands.

Piazza Armerina, 1905-1907	44,77 to 166,60 fr. (14*s* 4*d* to £2. 13*s* 4*d* per acre).
Terranova, 1890-1896 . . .	104,38 to 199,15 fr. (£1. 13*s* 5*d* to £3. 3*s* 9*d* per ac.).
Caltanisetta, 1906-1907, . .	20,56 to 104,61 fr. (6*s* 7*d* to £1. 13*s* 5*d* per acre).
Acireale (arable, trees) 1907	214,80 fr. (£3. 8*s* 9*d* per acre).
Caltagirone, 1906	16,66 to 34 fr. (5*s* 4*d* to 10*s* 10*d* per acre).
Catania, 1907	30,95 to 64,42 fr. (9*s* 11*d* to 20*s* 7*d* per acre).
Nicosia, 1900-1908	14,31 to 63,50 fr. (4*s* 7*d* to 20*s* 4*d* per acre).
Bivona, 1906-1908	28,57 to 76,22 fr. (9*s* 1*d* to 24*s* 4*d* per acre).
Girgenti, 1904.	82 to 95 fr. (26*s* 3*d* to 30*s* 5*d* per acre).

Sciacca, 1906-1907	20,41 to 59,00 fr. (6s 6d to 18s 10d per acre).
Castroreale, 1905-1906 . . .	16,38 to 87,97 fr. (5s 3d to 28s 2d per acre).
Messina (arable, trees) 1907	121,49 to 283 fr. (£1. 18s 10d to £4. 10s 7d per acre).
Mistretta, 1907	44,80 to 59,74 fr. (14s 4d to 19s per acre).
Cefalù, 1906-1907	29,70 to 87,90 fr. (9s 6d to 28s 1d per acre).
Corleone, 1906.	15,86 to 32,09 fr. (5s 1d to 10s 3d per acre).
Palermo, 1907.	25,00 to 98,86 fr. (8s to 31s 10d per acre).
Termini Imerese, 1907-1908	115,05 to 120,88 fr. (£1.16s 10d to £1.18s 8d per acre).
Modica, 1907	12,46 to 98,07 fr. (4s to 31s 4d per acre).
Noto, 1906-1907	43,01 to 53,01 (13s 9d to 16s 11d per acre).
Siracusa, 1907	37,78 to 58,92 fr. (11s 10d to 18s 10d per acre).

Province of Trapani: (Direct information, 1912). Rents are very variable, according to the fertility of the land and to its distance from the dwellings of the peasants.

They vary, for bare lands, from 45.60 to 76.50 fr. per ha (14s 7d to 24s 6d per ac.) on account of the competition among agricultural co-operative associations.

For limited plots of land (spezzoni) taken up by small farmers (borgesi) the above figures must be increased by 7.60 to 15.20 fr. per ha (2s 5d to 4s 10d per ac.) and upwards, reaching sometimes 100 fr. per ha (£1. 12s per ac.).

Near towns, good arable lands attain 153 fr. (£2. 9s per ac.). Market gardens 150 to 300 fr. per ha (£2. 8s to £4. 16s per ac.).

Pastures in the large estates (latifondi) fetch from 38.35 to 45.60 fr. per ha (12s 3d to 14s 7d per ac.).

GIODA, ALESSANDRO. **Proposals for the Formation of a Model Agricultural Contract.** (Relazione e proposte per la formazione di un contratto agrario modello). — *Estratto dal Bollettino del Consiglio Agrario di Mondovì.* Opusc., pp. 16. Mondovì, 1911. 557

Italy

The Executive Council of the Agricultural Society of Mondovì has a special committee entrusted with the study of the agricultural contracts which are in force in the neighbourhood, and with the task of drawing up a typical contract for each of the principal systems of land tenure.

The proposals made are as follows:

The Termination of Contracts.

1. The notice to quit may be dated, according to Piedmontese custom, up to March 30th, for the following Martinmas (11th November).

2. At Martinmas the out-going tenant must give up the land, without any right to the pasturage still available.

3. The clovers, unless sown in March by the in-coming tenant, must be reimbursed to the out-going farmer, only for the value of the labour, the seed and manure employed.

4. It should be incumbent on the owner at that time to buy the hay which is in excess of the provision for the season, at an estimated price as regards quality and quantity, due regard being paid to the burdens established by custom as regards the fertility of the soil.

5. The out-going tenant may not up to 11th November consume more than one-third of the straw produced in the year.

6. The out-going tenant may have during the year only the wood that he requires for his own use and must not remove any for whatsoever reason.

7. The out-going tenant may not sow winter cereals in greater quantity than that fixed by the rotation usage of the district; it is better to determine this limit as one half, or at the utmost three-fifths, of the whole area to be sown.

8. The owner may, if he pleases, buy the prospective crops to which the out-going tenant might still have a right (*e. g.*, wheat) if in the month of November he has an estimate made of the probable net yield in the following July, after deducting the cost of harvesting, threshing, etc., as well as a certain allowance for accidents.

As regards the duration of contracts, the Committee is of opinion that whether in the case of an ordinary lease, or in the case of a *métairie* (where the proprietor receives one half of the produce as rent), they ought to begin with a minimum term of three years. After this a tacit renewal of the contract — not for the same period, but only from year to year — would be the best course.

Nevertheless, since the question of improvements made on the estate by the tenant is closely connected with the renewal of the contract, the Committee recognises that, where the tenant is not allowed indemnity for the improvements carried out, it is necessary to concede — deplorable as it is under many aspects — a longer notice to quit, with a correspondingly longer term for the contract.

Improvements and Indemnity.

The Committee has shown considerable reserve with regard to improvements on the land, and expresses the hope that no limit be

placed on a reasonable indemnity for agricultural improvements, and hence proposes:

1. That the principle of indemnity for improvement carried out on an estate be recognised and admitted in so far as the cultivator may have been unable to benefit by them for a period sufficient to amortize his outlay, and in so far as the alleged improvements occasion no damage or depreciation chargeable to him.

2. That in the case of improvements on the estate of a permanent and extraordinary character (such as levelling, draining, irrigation, planting), the tacit consent of the owner shall be sufficient to justify the indemnity, provided a Committee of experts decide that from the said improvements the value of the estate will be so far increased as to exceed the ordinary interest on the capital invested in the carrying out of the same.

3. That in such a case indemnity as estimated by experts for the completed work shall be paid by the proprietor as follows: 3/5 of it in annual rates not exceeding 10 % of the annual income derived by the landlord from the estate; the remaining 2/5 to be disbursed, when the payment of these rates is finished, and provided the permanent utility of the improvements be still recognised. In case of a lease, the lease-holder shall pay the proprietor 4 % interest on the rates so disbursed. In no case shall the outlay for improvements exceed the landlord's net income for one year, when the contract is triennial; that for two years, on a six-year contract; and that for three years, on a nine-year one.

4. That for improvements on the estate relating to buildings there shall be a right to indemnity only when the written permission of the landlord has been obtained; the sole exception being when the said improvements are absolutely and urgently necessary for the health and safety of man and beast, according to the regulations laid down by sanitary and other legislation.

5. That in case of such improvements, when the landlord's consent is withheld, the cultivator shall be allowed to sell any excess of straw or forage that he may have, provided he uses a given quantity of chemical fertilisers in addition to the usual manuring; in accordance with an apposite compensation tariff to be drawn up by the Society.

6. That for agricultural improvements the indemnity shall be estimated only on the expiration of the contract, according to an apposite compensation tariff which the Society will formulate.

7. That the indemnity shall not include the partial renewal of plantations of trees, and the making of new meadows, corresponding to the breaking up of old ones.

8. As regards the property of charitable institutions the lease-holder shall have the preference up to 5 % less than the amount offered by the highest bidder in the competition for the tenure, provided always this does not mean a diminution of the rent he previously paid.

9. In case the administration should think fit to extend this preference to the out-going tenant, a sum corresponding to 5 % of the highest offer shall be paid to him, during the whole period of the lease, as indemnity for improvements, in three annual rates.

And in connection with the above the following should be noted:

10. During the last two years of his lease the tenant shall make no essential change in the manuring and rotation systems previously adopted.

11. All the credit for improvements allowed to the out-going tenant shall be debited to the new lease-holder.

Complete or partial Métairie (half-share Contracts).

Another point about which the Committee were interested in knowing the opinion of the farmers of the neighbourhood is that which concerns the possible adoption of the complete *métairie*, *i. e.*, where the live-stock is also included in halving the profits, because it is well known that in the district almost all the *métairie* (half-share contracts) only apply to the grain harvest or the seeds, and not to the meadows. This mixed form of contract is, however, very harmful, as it tends to check the spread of leguminous forage.

But on this point, as is clear from the replies quoted by the writer, neither proprietors nor farmers consent to the proposal. The Committee therefore, though still holding that the complete *métairie* (half-share contract), where the conditions are favorable, is the best form of share contract, proposes that those landlords, who cannot or will not give attention to the cattle, and prefer to go on letting their meadows, should insert in their contracts the following clause, which would go far to lessen the most serious drawback.

" It shall be allowed to the farmer who has a *métairie* contract to cultivate with leguminous forage plants a portion not exceeding one-fourth of the area of his arable land, as may be most to his advantage, and he shall pay the landlord a corresponding increase of rent, amounting to x francs per hectare. And he must declare before 15th April in every year what area of his leguminous crops he intends to keep down as meadow during the year.

" It shall be incumbent on the landlord to contribute half the

cost of the chemical fertilisers for the said leguminous crops, according to the formula which the Agricultural Society may submit as the best ".

As a model it may be stated that similar clauses have been adopted on the plain of the Tanaro near Alba, and that the conditions of rental vary from 50 to 75 francs per hectare (16*s.* to 24*s.* per acre).

In order to understand fully the value of the model contract which the Committee proposes to formulate, it should be remembered that there can be no absolute rigid rules for any contract, and that the Society intends always to allow the widest liberty in this direction, according to the different intrinsic and extrinsic conditions in each case.

HANSEN, I. **Economic Data respecting Four Years' Work connected with the Experimental Farm of Dikopshof.** — *Zweiter Bericht vom Dikopshof*, 1 Vol. pp. IX + 430; Betriebsergebnisse, pp. 11-33. Berlin, 1911. **558**

Some changes having been recently made at the experimental farm of Dikopshof, the present area under cultivation is apportioned as follows: **Germany**

Dikopshof.	Acres
Area of arable land including 1.11 ha. (2.74 acres) which is rented	283.29
Garden	1.88
Pasture	9.44
Wood	1.38
Yards, including manure pits, of 16 ares (1900 sq. yds.)	2.87
Area occupied by buildings	1.24
Nursery	1.11
Roads	6.70
Ditches	1.19
Gravel-pit	0.52
Total	309.62 Acres

Maarhof.

	Acres
Area of arable land	3.88
Garden and orchard	1.19
Buildings, yards, roads etc.	0.62
Total	5.68 Acres
General Total 127.61 ha.	315.33 Acres

Average production of the different crops per acre from 1904 to 1909.

Crop	Number of years	Area cultivated Acres	Production per Acre				
			Grain cwt.	Roots cwt.	Straw. cwt.	Hay. cwt.	Green Forage cwt.
Wheat	6	164.58	21.08	—	37.92	—	—
Summer wheat . . .	5	44.18	16.31	—	38.97	—	—
Rye	6	309.83	21.88	—	43.77	—	—
Barley	5	30.82	26.81	—	42.39	—	—
Summer barley . . .	6	50.63	21.18	—	30.36	—	—
Oats	6	292.36	24.29	—	35.28	—	—
Rape	3	15.32	13.44	—	—	—	—
Sugar beet	6	287.12	—	245.30	—	—	—
Mangolds	6	86.22	—	673.46	—	—	—
Potatoes	6	71.41	—	103.20	—	—	—
Jerusalem artichokes.	3	1.04	—	133.86	—	—	—
Clover	6	169.32	—	—	—	59.80	—
Lucerne	5	129.88	—	—	—	51.71	—
Vetches	3	50.83	—	—	—	—	155.75
Green maize	6	30.10	—	—	—	—	399.57

Average Receipts and Expenses.

Average receipts per acre of cultivated land 1905-1909.

	£ s. d.	£ s. d.
Crops:		
Cereals and colza	3. 3.7 ½	
Potatoes, straw etc.	6.6 ½	
Sugar beets	2. 0.0	
Leaves of sugar beets	4.3 ½	
		5.14. 5 ½
Draught animals:		
Horses	5 ¾	
Cattle	4.7 ¾	
		5. 1 ½
Stock:		
Cattle	2. 4.4	
Pigs for fattening and for breeding .	1. 6.0	
Sheep and wool	8 ½	
Poultry	10 ½	
		3.11.11
Dairy Produce:		
Milk sold at Bonn	7.11. 1 ¾	
Milk and butter sold at Dikopshof	12.10 ½	
		8. 4. 0 ¾
Sundries:		
Shooting rights	1. 7 ½	
Various receipts	1. 6 ¾	
State grants for experimentation	1.16. 5 ½	
		1.19. 7 ¾
Total receipts per acre		£ 19.15. 2

Average expenses per acre of cultivated land 1905-1909

	£ s. d.	
Enlargement and upkeep of buildings	1. 2. 2 ½	
Increase of draught animals	5. 9	
» of breeding »	2.12. 2 ½	
Purchase and upkeep of machines etc.	1. 3. 7	
Wages aud piece work	5. 5.10 ¼	
Labourer's food	1 3.11 ½	
Heating and lighting	7. 7 ½	
Insurance	12. 1 ¼	
Working expenses of dairy	11. 4 ¼	
Various rents	2. 4 ¼	
Food stuffs	3. 4. 1 ½	
Manures	1. 2. 8 ¾	
Seeds	9. 0	
General expenses	7. 8 ¼	
Total		£ 18.10.7
(Including £ 4.4*s.* 4*d.* for experimentation).		
Profit		1. 4. 7
		£ 19.15. 2

Capital per acre of cultivated land.

	£ s. d.	£ s. d.
Buildings		25.10. 9 ½
Live stock:		
Horses	1. 0. 3 ¼	
Draught oxen	11. 6 ¾	
Breeding cattle	5.14. 4 ½	
Pigs	14. 3	
Sheep	1. 9	
Poultry	5 ¾	
		8. 2. 8 ¼
Dead stock		8. 7. 4 ¾
		£ 42. 0.10 ½

The total increase of the value of buildings and live and dead stock at the end of 1909 was £ 300.13*s.* 5*d.*

Comparative Value of Farm Lands, Buildings, Machinery, etc. in the South and in the United States. — *Manufacturers' Record*, 60 (1911) No. 5; *E. S. R.*, Vol. XXV, No. 8, pp. 789. Washington, 1911. 559

United States

This article presents by notes, statistics, and illustrations the agricultural progress of the South from 1900 to 1910. Compared with the country as a whole the increases in certain farm lines are shown as follows:

Comparative value of farm lands, buildings, machinery etc.; in the South and in the United States.

	The South			The United States		
	1900	1910	Increase	1900	1910	Increa
	$	$	%	$		%
Farm lands value. .	2 388 593 000	5 209 676 000	118	13 051 033 000	28 383 821 000	118
Farm buildings value	685 188 000	1 314 429 000	92	3 556 614 000	6 294 025 000	77
Machinery etc. value	167 349 000	262 090 000	57	749 778 000	1 261 817 000	68
Improved acreage .	116 781 000	131 958 000	13	414 490 000	477 424 000	15
Fertilizers cost. . .	29 006 000	74 703 000	157	53 630 000	114 273 000	113
Labor cost . . .	81 781 000	149 463 000	82	357 393 000	651 862 000	82

Additional tables are given showing the aggregate value of farm lands by States, also the value of farm buildings and farm machinery, improved acreage, expenditures for labor and fertilizers, average value per acre of lands alone, and values of 12 leading crops in 1900 and 1910.

BILLINGS, GEO. A. and BEAVERS, J. C. **Systems of Farming in Central New Jersey.** — *U. S. Dept. of Agric., Farmers Bulletin 472.* Washington, December 1911. 560

United States: New Jersey

The Section of which this Bulletin treats is situated in the coastal plain region of central New-Jersey.

There are few sections in the United States where soil fertility and profitable farming have been so generally maintained as in central New Jersey, although the land has been farmed for more than 150 years.

The soil, the climate, and the location render central New Jersey well adapted both to general and to specialized farming.

This Bulletin discusses the prevailing systems and describes some of the methods followed by the more successful farmers.

In order to show the financial returns on the high-priced farm land in this section, a farm was selected having conditions as nearly

typical as possible in respect to soil, type of farming, and cropping system, and at the same time having records for a long period of time. The tenant farm described below fulfils these conditions, with the possible exception that the soil is a little heavier than on the majority of farms in this section.

This farm, situated 1 ½ miles from the village and containing 175 acres, was purchased by the present owner in 1868 for $ 150 per acre. It was necessary for the purchaser to go heavily in debt when the purchase was made. This debt was paid gradually by the sale of products from the farm. In 1896 the owner had accumulated sufficient wealth to enable him to retire from active farm life and move to a very comfortable home in town. When the owner made the change, one of the men who had been employed on the farm as a laborer for several years rented the farm. He had saved up $ 1000 and had to go in debt about $ 2000 more for work stock, farm machinery, etc.

The tenant has remained on the farm continuously since that time, and has by careful management not only maintained crop productiveness, but has made the farm profitable to both owner and tenant.

The tenant owns now all the farm machinery and work stock, and all the productive live stock is owned jointly by landlord and tenant. The landlord pays for all repairs and improvements, for all lime and manures purchased, and for three-fifths of the fertilizer. The amount expended for seeds, spraying material, and the like is shared equally. The tenant furnishes all of the labor. The net proceeds from the sale of all farm crops, live stock, and dairy products are divided equally. The live stock are fed from the undivided crops, except that grain for the work horses is furnished by the tenant from his share of the corn crop. In addition to the above the tenant gets all the milk and butter necessary for the family use, and both he and the landlord get all their potatoes and fruit in season from the farm.

The general practice, on this farm, has been to grow from 20 to 25 acres of corn, 25 to 32 acres of potatoes, 20 to 25 acres of wheat, with the remainder of the land, about 75 acres, in hay.

The area of sod broken each year is about equal to the area seeded to clover and grass. The general rotation has been (1) corn, (2) potatoes, (3) wheat, (4) clover and timothy, and (5) timothy.

Labor and Equipment.

The tenant keeps three men besides himself throughout the year, and one extra man from April 1 to November 1; that is,

outside of his own labor, one man for each team during the working season.

Four work teams are required on this farm in order to get work done in season, which means about one man and team for every 37 ½ acres of cultivated crops, grain and meadows, or for about each 20 acres of cultivated crops and grain.

The farm buildings consist of one storage and stock barn, two hay storage barns, one fertilizer and seed storage building, corn-cribs, and tool sheds.

The inventory of tools and live stock belonging to the tenant is given in the following table:

Number	Item	Value $
5	Wagons, two horse at $ 75 each . . .	375.00
1	Spring wagon, one horse	45.00
4	Sets double harness at $ 25 each . .	100.00
1	Set single harness	20.00
1	Set light double harness	30.00
1	Platform scale, movable	10.00
1	Fan, hand power	9.00
1	Corn sheller, hand-power	3.50
1	Vegetable or root chopper	4.00
1	Wheelbarrow	2.00
1	Road drag, two-horses	3.00
1	Fertilizer drill	1.00
2	Potato wagon bodies at $ 15 each .	30.00
3	Hay shelvings at $ 15 each	45.00
1	Wheelbarrow seed sower	5.00
2	Fertilizer riddles at $ 1 each	2.00
1	Fertilizer distributor at $ 15, half interest	7.50
1	Roller or clod crusher, at $ 8, half interest	4.00
1	Wheat drill, at $ 75, half interest . . .	37.50
1	Paris green dusting cart at $ 40, half interest.	20.00
1	Corn harvester, six years' use	75.00
1	Wheat binder, eight years' use	70.00
1	Potato planter, two-horse	40.00
1	Potato digger, four-horse	65.00
3	Breaking plows, two-horse, at $ 7 each .	21.00
1	Turning and slicing harrow, three-horse	10.00
1	Spring-tooth harrow, two-horse	10 00
	Carried forward	1044.50

	Brougt forward	1044.50	
2	Disk harrows, two-horse, at $ 16 each	32.00	
1	Lever drag harrow, two-horse	5.00	
2	" α " harrows, two-horse, at $ 11 each	22.00	
4	Cultivators, one-horse, at $ 3 each . .	12.00	
3	Cultivators, two-horse, at $ 30 each . .	90.00	
2	Mowers, two-horse, at $ 38 each . . .	76.00	
1	Hay tedder, two-horse	30.00	
1	Hayrake, two-horse, dump	15.00	
1	Hayrake, two-horse, side delivery . .	65.00	
1	Hay loader	65.00	
3	Hayforks, for elevating hay in barn, at $ 8 each.	24.00	
	Rope for hayforks	10.00	
	Small tools, etc.	100.00	
			$ 1590.50

Live stock

8	Horses at $ 200 each	1600.00

Farm stock owned jointly by landlord and tenant.

10	Head of cattle at $ 40 each, half interest	200.00	
3	Brood sows, at $ 20 each, half interest	30.00	
1	Boar, at $ 25, half interest	12.50	
			$ 242.50
	Tenant's total investment . . .		$ 3433.00

The list of farm tools is very complete and the tools are kept in good repair

The list may be taken as fairly representative of what is required in this type of farming.

Very few articles could be dispensed with without inconvenience except the corn binder, now seldom used. Corn (maize) is cut and shocked by hand, because the tenant believes the hand method to be the more economical.

The cost of equipment, outside of buildings, on this farm is seen to be about $ 23 per acre of tilled land (150 acres). The capital invested in implements and machinery amounts to $ 20,60 per acre, that invested in work stock $ 10,65 per acre, and in other stock $ 2,62. The system of farming does not require the keeping of large power machinery.

The following table gives the income and expenses of the landlord as taken from his books for the 10-year period from 1900 to 1909 inclusive:

INCOME

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
	$	$	$	$	$	$	$	$	$	$
Potatoes	615,32	1 695,00	1 262,00	926,57	1 389,74	1 233,44	1 450,00	2 993,77	2 194,65	1 514,93
Hay	604,43	780,97	484,10	684,95	732,85	384,17	889,37	1 007,96	1 095,34	977,28
Wheat	162,34	169,90	196,00	274,40	313,50	212,50	323,23	316,35	313,90	362,87
Live stock	486,47	375,85	496,08	453,58	453,92	528,43	472,92	526,48	361,72	444,49
Boarding horses	—	—	75,00	38,50	70,70	75,00	121,42	167,20	433,19	367,32
Miscellaneous (fruit, corn, etc.)	52,50	13,90	285,50	107,03	53,98	39,00	272,06	305,41	315,66	255,00
Total	1 921,06	3 035,62	2 799,58	2 488,03	3 014,69	2 472,50	3 533,00	5 317,17	4 714,46	3 921,89

EXPENSE

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Seeds	109,65	111,62	93,29	141,63	150,00	172,45	138,25	180,50	236,30	189,51
Live stock	55,00	29,50	38,50	45,62	95,00	47,00	43,75	39,50	104,50	39,25
Fertilizer	484,20	538,20	696,55	444,00	420,00	420,00	447,75	477,75	479,96	686,52
Repairs (buildings, fences, etc.)	—	—	—	—	—	—	—	243,00	—	120,00
Miscellaneous: Lime, Paris green, feed, etc.	15,68	10,36	16,14	136,20	26,00	528,25	33,50	154,00	17,40	119,73
Total	664,53	689,68	844,48	767,45	691,00	1 167,70	663,25	1 094,75	838,16	1 155,01
Net profit	1 256,53	2 845,94	1 955,10	1 720,58	2 323,69	1 304,84	2 869,75	4 222,42	3 876,30	2 766,88

In addition to the receipts shown in the preceeding table, the landlord has received sufficient feed from the farm to board two horses, which at average farm prices for 10 years would be worth $ 110 per horse, or $ 220 for the two horses for each year. The additional perquisites which the owner receives from the farm are probably worth $ 30 per year, which makes the additional income equivalent to $ 250 per year.

Against this must be charged the farm taxes and insurance, which averages between $ 170 and $ 180 per year. Deducting $ 180 for taxes and insurance from $ 250, the value of perquisites, there is left $ 70, which should be credited to the farm income.

The valuation of the 175 acre farm at present is $ 35 000. During the 10 year period, of which account is given, the average net profit to the landlord has been $ 2524.20 besides perquisites to the amount of $ 70 or more. This gives an interest of 7 ¼ per cent per annum on a valuation of $ 200 per acre.

No accurate account of the net income of the tenant farmer is available, except that for the 13 years he has operated the farm he has been able to save $ 500 per year after paying all expenses.

He has brought up a family, and for the greater part of this period he was required to hire a housekeeper.

From the detail of expenses of both the landlord and tenant for seed, fertilizer, and lime, some interesting figures can be deduced. During the 10 years the average cost of seed potatoes has been $ 8.50 per acre planted. It has been necessary to spray for potato bugs with Paris green 7 of the 10 years, and the average annual cost of materials has been about $ 1.25 per acre sprayed.

Commercial fertilizer has been one of the big expenses on this farm and the average annual expense for this purpose has been $ 5.66 for each acre in cultivation. The cost of grass and clover seed about $ 2.50 to the acre of grass sown.

Lime has not been used on the farm every year, but since its use has become more prevalent, there has been a marked improvement in the yield of crop, especially of clover and timothy. The average expense for each of the seven years since the use of lime, including years when no lime was used, is $ 115.82 a year.

A more carefully laid farm plan, the rearrangement of fields in order to sav· labor and establish a more definite rotation, and the growing of more legumes, either as cover crops or as a regular farm crop, are the principal suggestions for this section.

LLOYD, W. A. **A Successful Alfalfa and Truck Farm in South-eastern Ohio.** — *Ohio Agricultural Experiment Station: Circular* No. 107, pp. 1-20. Wooster, Ohio, 1911. 581

United States: Ohio

The farm under discussion is located in Star Township, Hocking County near the town of Haydenville. It is five miles from Nelsonville, Ohio, a town of eleven thousand inhabitants.

The farm contains 500 acres of land. It lies on both sides of the Hocking River and consists of 120 acres of fine sand and silt loam, river bottom land, and 380 acres of hill land, 200 of which are in permanent pasture and the remainder in timber.

The permanent live stock consists of four milch cows, ten work horses and one brood sow; on the pasture from 150 to 250 sheep are kept; from 15 to 20 hogs are fattened annually. A flock of 200 hens is kept. The bottom land, which is the only part of the land occupied by farm crops, is utilized as follows: alfalfa (lucerne) 30 acres; corn (maize) 25; wheat, 20; potatoes, 15; melons, 7; cabbage, cucumbers, onions, beets, etc. 8; household and waste 15.

The alfalfa is usually allowed to stand three to four years, after which the land is ploughed for corn and yields from 75 to 90 bushels of corn per acre.

Wheat has yielded only about 15 bushels per acre and is not considered profitable. It has only been retained in the rotation as a means of securing alfalfa. Potatoes produce a larger amount of gross income than is secured from any other one crop on the farm. Crimson clover and rye are sown after the potatoes have been harvested. The rye is manured during the winter, using from 10 to 12 tons per acre and is turned under in the spring after it has made a good growth. The melon crop has been a profitable one in the past; but for three years it has been damaged by an attack of a small larva which burrows in the root, and causes the plant to die. Experience in former years with this larva, has caused to be taken out what is termed "mutual insurance"; *i.e.* after the melons are planted, two rows of late cabbage are planted between each two rows of melons. These are to be removed if the melons escape destruction. The practice of raising two and in some cases three crops on the same land each year is a distinguishing feature in the management of this farm. In this way the area devoted to the garden crops is more than doubled.

So far as possible all crops are marketed direct from the field. Alfalfa hay is sold at $12 per ton delivered loose from the field. The shrinkage on alfalfa hay between harvest and January under ordinary storage conditions has been ascertained to be about

20 %. Corn was sold last year at 70 cents per bushel and potatoes at 85 cents.

During the truck season wagons run every day with beets, onions, sweet corn, beans, cucumbers, and other garden stuff to supply the wants of the mining and factory people.

The greater part of the produce is sold wholesale to dealers.

Manure is bought and shipped from the mines and from Nelsonville. Usually 400 tons are secured in this way annually at a cost of 75 cents per ton spread on the field.

In addition to the manure, about 10 tons of high grade steamed bone is used which costs $27 per ton in car lots.

Eight years ago forty acres of hill land were set to an apple orchard; peach trees were used as fillers between the apple trees. As soon as the apple crop becomes profitable a cold storage building will be erected in which to handle it.

The management of the labor proposition on this farm is worthy of particular consideration. The hands employed regularly reside on the farm. They are paid a cash wage of $ 1.20 for ten hours work. In addition to this each head of a family is furnished a house, rent free, with a garden and the use of a horse to a plough and tend it. During the busy season some extra help is employed. In the winter the manure is procured and spread on the fields and a number of bank props are cut and marketed.

When work is slack some of the men are permitted to work in the factory or mines for short periods, returning to the farm again when there is need for them. During the time they are working away from the farm they pay $ 3 per month house rent.

The machinery for the operation of the farm consists of a very complete outfit, well adapted to the operations involved. There may be enumerated a traction engine, husker, shredder, self binder, mowing machines, side delivery rakes, potato planter, potato digger, grader, power sprayer, ploughs, cultivators, etc., on which the owner places a total value of $ 3 500.

The land investment is the following:

120 acres (including improvements) which is valued at $ 100 per acre, total value .	$	12 000
380 acres (including improvements) which is valued at $ 25 per acre, total value . .	»	9 500
Total. . .	$	21 500

For this the tenant pays a cash rent of $ 1200 or nearly 6 %. If we deduct the value of the hill land, from which he gets very

little return, he is paying $ 10 per acre for the remaining producing part of the farm or 10 % on the investment. Figuring 4 % as a fair return for the money, this would represent a land value of $ 250 per acre.

The following items of gross receipts and expense are taken from the day book of the farm:

Alfalfa hay	$	1 295	
Corn: 700 bushels at 70 cents per bushel	»	490	
Wheat: 100 bushels at $ 1.00 per bushel	»	100	
Total farm crops		——	$ 1 885
Potatoes: 300 bushels at 85 cents per bushels	»	2 550	
Melons	»	297	
Cabbage	»	150	
Sugar corn	»	500	
Other small stuff	»	400	
Total garden		——	$ 3 897
Sheep (wool only)	»	175	
Hogs	»	300	
Chickens (eggs)	»	150	
Total live-stock and poultry		——	$ 625
Bank props	»	275	
Outside labor	»	150	
Total miscellaneous		——	$ 425
Total gross income			$ 6 832

Expense.

Rent	$	1 200
Interest on investment: live stock (owner's valuation)		2 260
Equipment (owner's valuation)		3 500
Total	$	5 760

At 5 %	$	288
Labour	»	1 084
Manure	»	225
Commercial fertilizers	»	270
Five per cent depreciation on machinery	»	175
Repairs on machinery	»	160
Taxes	»	40
Seeds	»	70
Insurance	»	5
Total expense	$	3 517
Net returns from the farm	$	3 315
		6 832

No household account is kept, so that the surplus over the cost of living is not obtainable. The tenant considers his time worth $8 per day.

This would amount to a salary of $2 500 per year and would still leave him a confortable balance of $875 for a sinking fund.

The splendid success achieved on this farm is, as is nearly always the case, largely attribuable to the personality of the man.

If we were to measure his success on a percentage basis we would make it:

Individuality of the manager	75 %
Advantageous location of farm	15 %
Land	10 %

562 ELLIS, L. W. **A Study of Farm Equipment in Ohio.** — *Ohio Agric. Exp. Station: Bulletin* 227, pp. 203-253. Wooster, Ohio, 1911.

United States: Ohio

This Bulletin presents the results of a study of farm equipment under the joint auspices of the Office of Farm Management of the U. S. Department of Agriculture and the department of cooperation of the Ohio Agricultural Experiment Station on a number of Ohio farms, where conditions were unusually favorable for obtaining information as to the proper relationship between investments in land, improvements, live stock, machinery, tools and other farm equipment.

Considerable data and a number of tables are presented illustrating the distribution of investments and showing the approximate cost and value of many items which serve to illustrate by

concrete examples many of the factors to be taken into consideration in equipping farms.

Other tables show the average area and the volume of space devoted to live-stock enterprises, and the storage of products, machinery etc. in buildings, and the cost, value, and number of rods of f ncing per acre on each of 21 successful farms.

As to distribution of acreage by entreprises it is shown for the group of 21 farms, with an average size of 165.88 acres that each has an average of 5.51 acres included in lots, lanes, waste spots, public roads, and other lands beloging to the farm which can not be properly charged to any other enterprise or group of enterprises; 2.04 acres in dooryard, family garden, and orchard, when not grown as a commercial proposition; 0.08 acres in tenant yards, gardens, etc.; 46.5 acres in lots, pastures, and fields devoted exclusively to live stock; 85.71 acres in tilled and mowed fields; 2.98 acres in permanent groves maintained largely for the production of maple sugar or syrup; 1.95 acres in fruit orchards largely commercial in their nature; and 21.11 acres in woodland. The mean average in crops is shown to be 52.8 per cent.

The first cost of equipping an average farm in Ohio is approximately as follows:

Land 165 acres at $ 46.25 (average) per acre	$ 7 676.42
Farm buildings	$ 2 700.—
Household buildings	$ 2 500.—
Fences	$ 763.74
Drainage	$ 366.43
Water supply	$ 225.—
Work animals	$ 640.71
Colts and driving horses	$ 250.95
Cattle	$ 582.26
Sheep	$ 201.05
Swine	$ 158.34
Poultry	$ 52.60
Bees	$ 3.23
Harness	$ 131.05
Machinery	$ 1 125.48
Minor articles	$ 200.00
Produce, supplies etc.	$ 631.93
Total	$ 18 209.19

Of course, this applies only to farms equipped outright with new buildings, fences and machinery.

The average cost per acre per year of machinery, which is represented by the sum of depreciation, repairs, and interest, is shown to be as follows.

Walking plough	$ 0.072
Riding or gang plough	0.183
Spike harrow	0.019
Spring harrow	0.027
Disk harrow	0.049
Roller	0.020
Planker or drag	0.008
Weeder	0.033
Corn planter	0.081
Horse cultivator	0.043
2-or 3-horse cultivator	0.041
Corn binder	0.369
« Corn shocker »	0.842
Grain binder	0.264
Grain drill	0.130
Hay loader	0.248
Mowing machine	0.105
Hayrake	0.055
Tedder	0.164

568 PUGSLEY, C. W. **Cost of Growing Crops in Nebraska.** (*Nebraska Sta. Bull.* 122, pp. 3-12). *E. S. R.*, Vol. XXV, No. 7, pp. 690. Washington, 1911.

United States: Nebraska

The data reported in this Bulletin were secured by correspondence with a large number of farmers in various parts of the State and are given as an indication of the cost of production of the most common farm crops on an average Nebraska general purpose farm.

The following table summarizes data as to the average cost of growing corn, wheat, oats, wild hay, clover, and alfalfa, including interest and taxes and the time for men and teams while in the field, but not including marketing.

Average cost of producing various field crops in Nebraska.

Kind of Crop	Yield per acre	Cost per acre (1)	Cost per bushel or per ton (1)
Corn	39.30 bush.(1)	$ 11.63	$ 0.296
Wheat	22.20 »	» 11.19	» 0.549
Oats	35.00 »	» 11.39	» 0.325
Wild hay	1.25 tons	» 6.72	» 5.370
Clover	2.04 »	» 8.54	» 4.180
Alfalfa	3.33 »	» 10.33	» 3.100

The two greatest factors influencing the cost per bushel or per ton were the price of land and the yield per acre. At the average market prices the most profitable crops considered were wheat, corn and alfalfa.

FRASER, W. J. **To simplify Methods of determining the Profit or Loss of Milk Cows on the Farm.** — *U. S. Dept. of Agric.: Farmers' Bulletin No. 469. Experiment Station Work*, LXVI, pp. 1-24. Washington, 1911. 564

United States

In order to simplify methods of determining the value of individual cows, W. J. Fraser, of the Illinois Station, has prepared a table which is based on the findings of the department of dairy husbandry at that Station for the past 15 years. By means of this table, and knowing the annual milk yield, the profit or loss of any cow can be easily estimated.

Economic conditions are not the same in different parts of the United States and while the figures given apply especially to the Central West, the same should be found applicable to the entire country. In the eastern part of the United States feed is higher but the value of the product is also greater, while in the West the cost of keep will be less than in Illinois but the receipts for the product will also be less.

The price for the product is considered at the market value of butter fat at the creamery, and this price should be obtained by any dairyman in the State, no matter what his location.

The production per cow is the average for six years — the length of time cows are milked in most herds.

(1) The United States dollar = 49.32 pence ; U. S. bushel = 0.9692 imperial bushel; ton = 2000 lbs. $1 per U. S. bu. = 4*s* 2*d* per imp. bu.; $1 per short ton = 4*s* 7 1/4 *d* per long ton. (*Ed.*).

The value of the cows producing the different yields is estimated as nearly as possible at their actual market price. Cows producing 2 000 pounds of milk are valued at $ 30 and their value increases $ 5 for every additional 1 000 pounds produced up to 6 000 pounds, above this $ 10 for every 1 000 pounds increase in production.

The value of cows when disposed of is estimated at $ 30 for cows producing 2 000 pounds of milk, and this price decreases to $ 25 for cows giving 5 000 pounds of milk and above.

The amount of skim milk is figured as 85 per cent of the whole milk.

Skim milk is valued at 20 cents per hundred pounds, since the best data show that it requires an average of 5 pounds of skim milk to equal 1 pound of grain in pork production.

Calves from cows producing less than 5 000 pounds of milk annually are considered at veal prices only and are valued at $ 3 when 5 days old, when the milk of the dam is fit for use. From cows producing more than 5 000 pounds of milk annually the value of the heifer calves increases more rapidly, as the dams are more efficient producers. Bull calves are not considered of value except for veal, unless they are from cows producing an average of 10 000 pounds of milk annually, in which case their value is placed at $ 16, and this value increases at the same rate as the heifers from higher producing dams.

The manure is figured at 11 tons per head for cows producing 8 000 pounds of milk. On the 20 acre farm at the Univers ty last year cows which were kept in the barn during the winter and in a dry lot during the summer produced 13 tons of manure per cow. The average value is considered at $ 1.50 per ton.

At the Illinois Agricultural Experiment Station, on a three year rotation of corn, oats, and clover, manure has increased the crop yield $ 1.60 for each ton of manure used, figuring the market value of the crops, for the first three years after it is applied. No consideration is taken of the increased production from the effects of the manure after the first three years.

At the Ohio Experiment Station the value of the crop yields has been increased $ 2.34 for each ton of manure used. From the figures above stated, $ 1.50 a ton is a conservative value on cow manure which has been well cared for. Cows which produce less than 8 000 pounds of milk will produce, on the average, less than 11 tons of manure. The value of manure is lowered 50 cents per cow for every 1 000 pounds decrease in production of milk below 8 000 pounds, and raised 50 cents per 1 000 pounds increase in production above 8 000 pounds.

The labor per cow at the dairy of the University of Illinois has amounted to $ 22, where the cows were stabled continuously throughout the year. This is more, decidedly, than it will cost under the ordinary farmer's conditions; hence $ 20 is taken as a basis for labor on cows producing 8 000 pounds of milk annually.

The labor for cows producing less than 8 000 pounds of milk will not be materially less, as feeding, watering, cleaning stables, and caring for the individual cows will be practically the same, regardless of their production. The labor is reduced only 50 cents for every 1 000 pounds decrease in milk production below 8 000 pounds, making a minimum cost on a cow producing 2 000 pounds of milk $ 17.

With increased production, only a small amount of extra labor is required in caring for the cows and $ 1 is added to the cost of labor for each 1 000 pounds increase in yield.

The average barn for a herd of 40 cows is worth $ 2 000, or $ 50 per cow. The interest on this per cow would amount to $ 2.50 a year, and taxes, insurance, repairs, and depreciation will amount to $ 1.50 a year, making a total cost per cow for buildings and their maintenance of $ 4 a year.

The total annual expense of keeping a good pure-bred sire, including feed, care, and depreciation, is $ 75. In a herd of 40 cows $ 2 per cow must be allowed annually to have each calf sired by a pure bred. Spraying materials, medicine and veterinary service are estimated at 10 cents per 1 000 pounds of milk produced. An allowance of 5 cents per 1 000 pounds of milk produced is made for dairy utensils, since the cost of these will depend somewhat upon the amount of milk handled.

To obtain the final results of profit or loss per cow, the milk, to be as near the average for all breeds as possible, is considered to contain 4 % butter fat, which is the average of the 1 200 cows tested by the Illinois Experiment Station. In applying the table to a herd, computations for each individual cow must be made, depending upon the total amount of butter fat in her milk.

The value of the butter fat is based upon the Elgin prices for butter during the years 1907 and 1908 which averaged slightly above 27 cents per lb. The overrun, which is the amount of butter made above the amount of butter fat, is allowed for the expense of making the butter.

The cost of feed per cow is based on the prices of feed for the past two years, which is decidedly higher than formerly. The cost of feed is raised $ 2 for each 1 000 pounds increase in production of milk.

MILK PRODUCED PER YEAR	2 000	3 000	4 000	5 000	6 000	7 000	8 000	9 000	10 000	11 000	12 000	13 000	14 000	15 000
1. Value of cow at first freshening	$ 30,00	35,00	40,00	45,00	50,00	60,00	70,00	80,00	90,00	100,00	110,00	120,00	130,00	140,00
2. » » for beef at end of life.	$ 30,00	29,00	27,00	25,00	25,00	25,00	25,00	25,00	25,00	25,00	25,00	25,00	25,00	25,00
3. Difference or depreciation during life	$ 0,00	6,00	13,00	20,00	25,00	35,00	45,00	55,00	65,00	75,00	85,00	95,00	105,00	115,00
4. Pounds milk produced.	lb. 2 000	3 000	4 000	5 000	6 000	7 000	8 000	9 000	10 000	11 000	12 000	13 000	14 000	15 000
5. Pounds skim milk, 85 % of whole milk	lb. 1 700	2 500	3 400	4 250	5 100	5 950	6 800	7 650	8 5000	9 350	10 200	11 050	11 900	12 750
6. Value of skim milk at 20 cents per lb.	$ 3,40	5,10	6,80	8,50	10,20	11,90	13,60	15,30	17,00	18,70	20,40	22,10	23,80	25,50
7. Value of each calf	$ 3,00	3,00	3,50	4,00	4,50	5,50	6,50	8,00	16,00	20,00	24,00	29,00	34,00	40,00
8. Value of manure	$ 13,50	14,00	14,50	15,00	15,50	16,00	16,50	17,00	17,50	18,00	18,50	19,00	19,50	20,00
9. Total value of skim milk, calf and manure.	$ 19,90	22,10	24,80	27,50	30,20	33,40	36,60	40,30	50,50	56,70	62,90	70,10	77,30	85,50
10. Cost of labor	$ 17,00	17,50	18,00	18,50	19,00	19,50	20,00	21,00	22,00	23,00	24,00	25,00	26,00	27,00
11. Interest, taxes, insurance and repairs on barn	$ 4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00
12. Service fee	$ 2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
13. Interest depreciation on cow	$ 1,50	2,62	3,89	5,15	6,14	8,10	10,06	11,98	13,97	15,93	17,89	19,85	21,61	23,77
14. Veterinary service, medicine and spraying materials . . .	$ 0,20	0,30	0,40	0,50	0,60	0,70	0,80	0,90	1,00	1,10	1,20	1,30	1,40	1,50
15. Depreciation on dairy utensils.	$ 0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1,00	1,05	1,10	1,15	1,20	1,25
16. Total expense of labor, housing, service fee, interest and depreciation on cow and utensils.	$ 25,30	27,07	28,99	30,90	32,54	35,15	37,76	40,83	43,97	47,08	50,19	53,30	56,21	59,52
17. Do skim milk, calf and manure pay labor, interest and depreciation on cow?	$ − 5,40	− 4,97	− 4,19	− 3,40	− 2,34	− 1,75	− 1,16	− 0,53	+ 6,53	+ 9,62	+ 12,71	+ 16,80	+ 21,09	+ 25,98
18. Pounds butter fat in 4 % milk	lb. 80	120	160	200	240	280	320	360	400	440	480	520	560	600
19. Value of butter fat at 27 cents per pound.	$ 21,60	32,40	43,20	54,00	64,80	75,60	86,40	97,20	108,00	118,80	129,60	140,40	151,20	162,00
20. Cost of feed per cow	$ 34,00	36,00	38,00	40,00	42,00	44,00	46,00	48,00	50,00	52,00	54,00	56,00	58,00	60,00
21. Profit from butter fat over feed	$ −12,40	− 3,60	+ 5,20	+ 14,00	+ 22,85	+ 31,60	+ 40,40	+ 49,20	+ 58,00	+ 66,80	+ 75,60	+ 84,40	+ 93,20	+ 102,00
22. Total year's profit per cow	$ −17,80	− 8,57	+ 1,01	+ 10,60	+ 20,46	+ 29,85	+ 39,24	+ 48,67	+ 64,53	+ 76,42	+ 88,31	+ 101,20	+ 114,29	+ 127,98

This increase is based upon a large number of yearly records kept at the University of Illinois where an accurate account is kept of all feed consumed and milk and butter fat produced for the entire year, on cows that vary in production from 2 000 to 15 000 pounds of milk annually. The table may safely be used as an index to profits; the figures are based upon definite data worked out at the experiment station, but the results will fluctuate slightly, according to the way the herds are fed. The price of feed varies in different years, but as a rule the price of the product varies with the feed, so that this fluctuation is small.

When a dairyman uses this table, the question is not whether the results obtained are absolutely correct to a few cents, as it makes no special difference to a farmer whether a cow brought in a profit of $ 10 or $ 10.50, but it does make an enormous difference whether she lost him $ 5 or made him $ 20, as may be easily done by ordinary cows producing within the range of many cows in the average herd.

AGRICULTURAL INDUSTRIES

INDUSTRIES DEPENDING ON ANIMAL PRODUCTS

MARCAS, L. M. and HUYGE, M. C. **Alterations in Milk after Milking.** (Altérations du Lait postérieures à la Traite). — *L'Industrie Laitière*, 37e Année, No. 3, pp. 40-42. Paris, 21 Janvier 1912. 565

France

In order to determine the frequency of the presence of ammonia in commercial milk, the writers examined 38 samples of milk, taken from different Belgian towns. In 11 samples no trace of ammonia was found; in 8 the reaction was weak, in 10 it was strong, and in 9 it was very strong. The chemical analysis of these samples showed that non-watered milk may contain ammonia, as well as watered.

Further, forty samples of milk taken from healthy cows, with every attention paid to cleanliness, showed not the least trace of ammonia, even when spontaneons coagulation set in.

The presence of ammonia in pure, *i.e.*, non-watered, milk, may be attributed to two causes:

1. Improper conditions of milking, such as bring about contamination by ammonia-producing organisms. In this case the milk only shows an ammoniacal reaction after being kept for a certain time. The ammonia is produced by the organisms decomposing the albumen, and hence the reaction increases with the age of the milk.

2. If milk just obtained contains ammonia, the reason must be sought in the absorption by the milk of the ammonia in the

atmosphere of the stall. This happens especially in the morning through insufficient ventilation during the night. In a stall of 506 cub. m. (17 870 cub. ft.), containing 15 animals, the writers found on an average 340 mgm. of ammonia per cub. metre, although the stall was well ventilated night and day. Here the fresh milk gave no ammoniacal reaction, but after 15 minutes it showed a slight, and after 45 minutes a strong reaction. The milk should therefore be removed from the stall immediately after milking.

566 TILLMANNS, Dr. F. **Rapid Preliminary Test of Milk for Water Adulteration** (Schnell auszuführende Vorprüfung der Milch auf Wasserzusatz). — *Molkerei-Zeitung, Berlin.* 22. Jahrgang, No. 4, pp. 39-40. Berlin, 27. Januar 1912.

Germany

The Author, during his work in the Municipal Hygienic Institute at Frankfort-on-Main, has found a simple method, which, by the use of nitric acid, indicates with fair reliability any addition of water to the milk. He prepares a diphenylamin reagent in the following way: 0.085 gm. of diphenylamin are placed in a measuring jar of 500 cc. capacity, and 190 cc. of diluted sulphuric acid (1: 3) poured onto it; to this, concentrated sulphuric acid (S. G. 1.84) is added, and the whole is shaken; heating follows, and the diphenylamin dissolves.

The tube is then filled almost to the mark (500 cc.) with concentrated sulphuric acid and allowed to cool. After cooling, it is made up to 500 cc. with more sulphuric acid, the whole thoroughly mixed and preserved in a well stoppered bottle. The preparation will keep almost indefinitely. For its manufacture, sulphuric acid free from nitric acid (prepared on the catalytic method) must be used, and distilled water free from nitric acid must be employed; this water can be prepared by adding a little caustic soda solution before distilling.

The milk test is carried out as follows: 5 cc. of milk are put into an agitating flask, and 15-20 cc. of diphenylamin reagent poured on; the whole is well shaken, and the resulting tint observed.

The following list indicates the different colour reactions taking place with different contents of nitric acid.

Contents of nitric acid per litre of milk	Colour of Mixture.
Non-nitric milk	Whitish turbid immediately after shaking up, pink to yellow-red in 3 - 5 minutes.
1-2 mgm.	No clearly perceptible difference as compared with milk free from nitric acid.
3 mgm.	1 - 2 minutes after shaking up, a distinct green tint which passes into a pale yellowish green to yellow within 5 minutes.
4 mgm.	Very soon after shaking up, a green colour appears, reaching its maximum in about 3 minutes, but already exhibiting a shade of yellow. This shade becomes gradually more distinct.
5-10-20 mgm.	Immediate and continually growing green colour; strongly fluorescent, with bluish tint in case of large contents of nitric acid.

The reaction is a genuine diphenylamin one according to the Author. He considers his method extremely well adapted for preliminary test of milk for *rapidly sorting different suspicious specimens*, and he thinks that the Police, Dairies and other institutions may advantageously employ this simple test with a view to subsequently subjecting the milk found suspect to a more thorough examination in a laboratory.

It cannot be gainsaid that very small quantities (1-2 mgm.) of nitric acid in the milk give no distinct reaction, because so small a quantity may have resulted merely from the rinsing of the vessels. On the other hand it need not be apprehended that the water used for adulteration contains too little nitric acid. When water is added to milk it is mostly well water in country places, and this water is almost always very rich in nitric acid.

INDUSTRIES DEPENDING ON PLANT PRODUCTS.

COVENTRY, B. **The Present Position of the Indian Sugar Industry with some Suggestions for its Improvement.** — *The International Sugar Journal*, No. 157, pp. 30-31. Manchester, January 1912. 567

The continual increase in the amount of foreign white sugar imported into India at a low price, has caused a diminution in **British India**

the area under sugar-cane and in the number of factories and refineries in the principal sugar-producing districts.

The amount of sugar imported, which never rose above 79 638 tons in the five years previous to 1889, now reaches 700 000 tons per annum.

The attention of the Government has been called to this matter, and the gravity of the situation was pointed out at the Agricultural Congress at Allahabad. A Congress is being held at Pusa, for the purpose of considering the situation and its improvement. The question is one of especial interest to the United Provinces, where half the sugar-cane grown in India is cultivated; the other Provinces can replace sugar by different crops.

The problem of sugar production in India is one of much complexity. While in other countries, the sugar producers aim at obtaining the maximum amount of sucrose (white crystallizable sugar), in India, on the contrary, the chief industry is the production of " Gur ", a mixture of crystallizable and uncrystallizable sugar.

The defects which exist in the Indian sugar industry are due to wrong and wasteful methods in manufacture, and to imperfect cultivation.

Among the defects in manufacture (mechanical) may be mentioned, in extraction due to low efficiency of the mills, imperfect methods of concentration, and wasteful and antiquated means of separating the molasses from the sugar.

While in other countries the usual crop is 30-40 tons of stripped cane per acre, in India 15 tons per acre is considered a good yield.

It has been recommended that a breeding station should be set up, preferably at Madras, which is the most favourable locality for the raising of new varieties from seed.

568 **Composition of the Wines of Chile.** (1) (Los Vinos en la Esposicion Nacional de Agricultura, Santiago, 1910. Le acidez Volátil en los vinos). — *Boletin de la Estación enológica de Chile*, No. 6, pp. 9-23; 24-31. Santiago de Chile, 1911.

Chile

On the occasion of the National Exhibition of Agriculture and Industry, which took place at Santiago at the end of 1910, the

(1) For further information on this subject see: GASTON CANU *Contribucion al estudio de los vinos chilenos. Boletin de la Estación enológica de Chile*, pp. 3-59. Santiago de Chile, 1910; *Estudios sobre los mostos*, 1910; *ibid.* pp. 65-104. (*Ed.*).

oenological station of that town made a collection of all the wines on view. Of these the best were analysed. The figures obtained were arranged in tables, and the wines of each district grouped together.

As a rule the alcohol percentage of the wines analysed varied from 10.5 to 12 degrees, and high grade white wines with a large percentage of alcohol and well balanced ingredients are chiefly produced in the Department of Maipo. In many of the samples the ratio of alcohol to dry extract exceeded the maximum figures laid down by Ganthier (4.6 for red wines, and 6.5 for white wines); and this applies specially to the wines of the Lontué district.

The total acidity is low, and often does not reach 4 gr. per litre (4 per 1000). The wines of the Lontué district are also noted for the small quantity of fixed acids that they contain.

As a rule the wines have proved themselves wholesome, the maximum quantity of volatile acid in the dry wines being found not to exceed 1.86; while 40 % of the wines contained of volatile acid less than 1 gr. per litre, and 74 % contained less than 1.25.

It has been noticed that the volatile acid of new Chilian wines averages, three months after the vintage, from 0.50 to 0.60 gr. per litre.

The ash is usually normal in quantity. The wines of 1911 were in comparison with those of the two preceding years, richer in potassium sulphate, a fact which shows that the practice of treating the must with sulphurous acid and with calcium sulphate is considerably extending.

In 84 % of the wines the alcohol *plus* the acidity exceeds 14.5 — which proves the quality of the product.

PARIS, G. **Grape Pips** (1). (I Vinaccioli). — *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLIV, fasc. 8-9, pp. 669-727. Modena, 1911. **569**

Italy

The revival of the industry of extracting oil from grape pips (an industry which is beginning to spread in Venetia and Apulia where it yields the best economic results) has given a more practical value to researches capable of simplifying the process.

A secondary industry has sprung into being by which the residues of wine-making can be turned to account.

(1) See also: *B.* June 1911, No. 1866; July 1911, No. 2251; and OTTAVI-MARESCALCHI: *I residui della vinificazione*, Casale, 1901. (*Ed*).

Grape pips which have hitherto been regarded from the point of view of vine reproduction and the manufacture of tannin, are now considered as the source of an oily matter, the extraction of which does not make the residue unfit for fodder, fuel or even manure.

This secondary product can therefore be completely utilised and all that is of agricultural value can be extracted.

To realize the importance of this industry, it should be remembered that the fresh residuum of pressed grapes contains 15-20 % of pips.

Each hectolitre of wine represents about 16 kg. (*i.e.* 16 %) of dry exhausted residuum capable of yielding 2.5 kg. (2.5 %) of grape pips.

Taking as a basis the average wine-production in Italy, from 60 million hl. (1320 million gals.) of wine, about 180 000 qls. (17712 tons) of oil might be produced, reckoning the amount of oil which corresponds to one hectolitre of wine at 300 gm. (= 0.3 %).

At the present time, when the need for fatty matters increases daily and still more the tendency to the utilization of by-products, such figures should not be neglected.

The articles by Ciapetti and Marre give interesting information concerning the technique of the extraction of oil from grape-pips: Ottavi and Marescalchi also, so long ago as 1901, devoted to this subject some pages of their hand-book dealing with the "Residues of Wine-Making" (*I residui della vinificazione*). The writer has now brought out a monograph dealing in an exhaustive manner with the technique and chemical side of the matter and treating from a chemical standpoint the nature of the fatty matters extracted, that of the ash of the grape pips, the carbohydrates, and the tannic and proteinic substances.

The results give the most complete information concerning the structure of the pips.

The following are the data resulting from analyses made by the Author of numerous samples of air-dried grape-pips:

Weight of a bushel	38.4 lb.
Water	8.99 — 11.95 %
Crude fat	13.73 — 19.51 »
Saccharifiable carbohydrates calculated as starch	9.37 — 11.66 »
Crude ash	2.51 — 3.72 »
Crude protein	9.83 - 11.26 »

Grape-pip oil is already much used in soap-making; it can be employed as a lubricant, an illuminant and, after careful purifying, for table purposes.

The technique of its extraction is that used in the case of all similar oils.

The oil is obtained according to the economic condition obtaining, either by crushing and pressure, or by the action of solvents. When purified and clarified, it is dark yellow and without smell. It becomes rancid on exposure to air, but if well kept this alteration does not take place so easily as is supposed.

From its iodine index it belongs to the drying oils.

Its constants are as follows:

Specific gravity at 15°C.	0.9502
Acidity	16.8
Saponification value	179.8
Iodine »	96.00
Acetyl »	143.1

Grape-pip oil before refining is worth 60 fr. per ql. (23*s* 9*d* per cwt.) and after refining 80 fr. (31*s* 8*d* per cwt.).

If mechanical extraction yields a better product and is preferable for the reasons given later, the method of extraction by means of solvents has great advantages also, which perhaps render it preferable. Some of these are the greater amount of the product (which however cannot be used in soap-making), a larger yield of oil by the grape-pips which have been distilled than by those that have not been submitted to this process; and lastly the possibility of selling with advantage the remaining pips to large factories which centralize this industry.

The oil-factories which treat the olive pomace with solvents buy dried grape-pips at 3 fr. per ql. (24*s* a ton.).

As solvents, the following substances are used: carbon disulphide, benzine and carbon tetrachloride; the latter has the advantage, among others, of not being inflammable and of leaving oil cake, which can be given to cattle without harmful results.

The technique of the extraction of this oil is that used in the case of other oleaginous seeds.

The cakes of grape-pips, which have undergone mechanical extraction, or been submitted to the action of benzine or tetrachloride, can well be used as a feed, especially if treated with molasses, or with the addition of other more concentrated nutritive substances.

In order to obtain a feed with albuminoid ratio of 1 : 6 suitable for draught cattle an d milch cows, it is sufficient to add to each part by weight of grape-pip oil cake 0.65 part of bran. With molasses feeds, the writer obtained excellent results by the addition of 50 parts of molasses to 100 parts of crushed cake. This gives a feed which, from its low cost, and its well-balanced nutritive constituents, would be very useful for draught or fatting cattle.

As a rule, cakes of grape pips are used as fuel, especially those which result from carbon disulphide extraction.

Their calorific power exceeds 4450 calories, approaching more nearly that of lignite than of peat.

Finally, the ash, of which the average proportion is 3 %, as we have seen, is sold at 2 fr. 50 per quintal (20*s* a ton.) and is generally used in soap factories.

It also makes an excellent manure, since the chief components of 100 parts of crude ash are:

Lime	28.67
Phosphorus pentoxide	22.93
Potash	21.52

Thus the by-product of wine-mahing is almost completely utilized and, for this reason, has a great economic importance.

570 Hoepfner, P. **The Future Importance of Lupin Cultivation on Light Soils in Connection with the Manufacture of Lupin Flakes.** (Die künftige Bedeutung des Lupinenbaues auf leichtem Boden bei Herstellung von Lupinenflocken). — *Illustrierte Landwirtschaftliche Zeitung*, 32. Jahrgang, No. 6, pp. 38-39. Berlin, 20. Januar 1912.

Lupin as a fodder plant acquires constantly growing importance with the manufacture of its grains into lupin flakes.

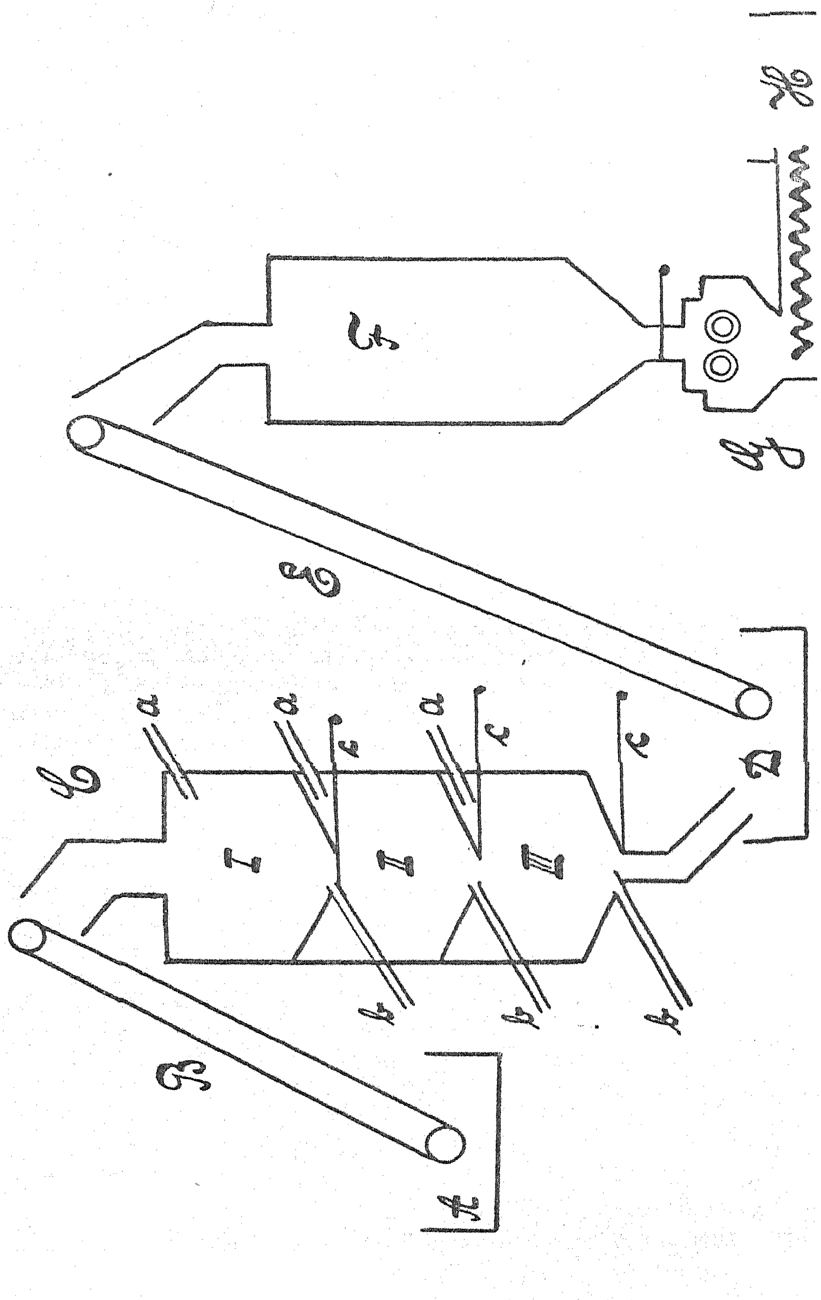
Germany

An appliance is now constructed having for its object the manufacture of lupin flakes on a large scale. The raw lupin grains are put into a box A and from here are conveyed by an elevator B into the eliminator C where they are disembittered; this eliminator has three divisions, I II & III. Each division has a water inlet and outflow tube *aa* and *bb*. In the bottom of each division a hole is also provided for discharging the lupins; this hole can

be closed by a slide *c*. In each division of the eliminator an inspection glass is fitted for checking purposes. The lupins are transported into division I and remain here for 24 hours, after which they pass into division II and then, after another stay of 24 hours here, enter division III; from the latter, a day later, they are transferred to the box D. Each division of the eliminator is filled with water when the lupins are inside; the water can be renewed as often as required; it should not be too warm because otherwise nutritious material is extracted. Before the lupins are discharged into the next division the water should be run off. The empty divisions are immediately refilled with lupins, so that from the fourth day onwards division III can be emptied every day. The lupins, after passing through the eliminator enter a box D and are from here conveyed by an elevator E into the Henze steamer F where they are steamed. It is as well to put some potatoes into the steamer at the same time; the lupins can then more easily be made into flakes; 100 kilogrammes of potatoes and 500 kilogrammes of lupins should be the most suitable ratio.

The steamed lupins pass into the dryer G, where they are worked up into flakes. The finished flakes are carried by a conveyor worm into a box H.

Lupin flakes contain about 36 % of digestible protein, 3.2 % of fat, 28-29 % of carbohydrates, 15.5 % of crude fibre and in addition about 11 % of water and a small percentage of ash. They can be used as horse and cattle fodder but are best mixed with other concentrated food; at the beginning the ratio should not be too high until the animals have got used to the fodder. Lupin flakes may also be advantageously employed as fish food.


A
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PLANT DISEASES.

GENERAL INFORMATION

STATIONS FOR PLANT PATHOLOGY AND AGRICULTURAL ENTOMOLOGY.

VERMOESEN. **The Plant and Seed Fumigation Station at Colombo, Ceylon.** (La station de fumigation des Plantes et des Graines, de Colombo, Ceylan). — *Bulletin agricole du Congo Belge*, vol. II, No. 4, pp. 718-722, fig. 333-335. Bruxelles, Décembre 1911. **571**

This Station was created with the object of preventing the importation into Ceylon of insects and fungi which might cause damage to the plantations in the island.

The Governor is vested with the power to enact all necessary measures. Consequently it is prohibited to import into the island the seeds and plants specified below through other ports than Colombo, and they will be subjected to immediate fumigation: tea seeds from India, cotton seeds, bulbs, roots and living plants of every description (except pulse intended for consumption), oranges and generally all citrus fruits. **Ceylon**

On arrival of the goods at the port, the consignee is bound to declare the nature of the contents of the packages.

The Station, which is very simple in construction and is situate near the Custom house, consists of three rooms. The first is used as an office, the second is " the large fumigation room ", communicating with the outside through an airtight door, and the third is " the small fumigation room ", half the size of the last named.

Wooden frames support a number of drawers intended to receive the material to be disinfected ; the number of these drawers can be increased in case of need.

The two rooms together suffice to disinfect 4100 kg. (80 cwt.) of tea seed in one operation.

An airtight barrel of a capacity of about 150 litres (5.3 cub. ft.) is used for treating small quantities of seed.

Tea seeds are treated with formol; other seeds and plants generally are fumigated with hydrocyanic acid, according to the formal instructions which are posted up inside the Station.

The disinfecting operations are gratuitous, and are carried out by a single officer of the Custom house staff, who likewise keeps the registers of the plants and seeds entering and leaving the Station.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

572 PANTANELLI, E. **The Vine Roncet.** (1) (Beiträge zur Kenntnis der Roncetkrankheit oder Krautern der Rebe). — *Zeitschrift für Pflanzenkrankheiten*, XXI Bd., Heft 2, S. 1-38, 29 Fig. Stuttgart, 20 Januar 1912.

Italy

After a historical summary of our present knowledge of this still ill-defined disease of the vine, the Author gives the result of his own morphological, anatomical and physiological enquiries directed to elucidating the true nature of the roncet. The last series of enquiries renders it evident that in the diseased plants serious disturbances of the assimilative activity of the green parts and metabolism takes place, which leads to the accumulation in the wood of the abnormal reserves formed. The abnormal composition of the ash and the derangements noted in the movement of the sap point to abnormal activity of the roots of the vines attacked by roncet.

(1) See *B.* June 1911, No. 1883. (*Ed.*).

RIVIÈRE, GUSTAVE and BAILHACHE, GABRIEL. **Remedial Measures against Chlorosis in Fruit Trees.** (1). (La lutte contre la chlorose des arbres fruitiers). — *Journal de la Société nationale d'Horticulture de France*, 4e série, tome XII, pp. 649-653. Paris, Décembre 1911. 573

France

The Authors have undertaken a series of experiments on treatment of chlorosis in fruit trees. For this purpose, instead of using, as hitherto, powdered ferrous sulphate introduced in big doses into a cavity made in the bottom of the trunk or the large branches of the chlorotic trees, they made use of citro-ammoniacal pyrophosphate of iron in a solution of a strength of 0.050 gr. per litre (= 005 %).

The Authors proceeded as follows in their experiments: In the trunk, about 4 in. below the fork they hollowed out a cylindrical cavity horizontally as far as the pith, and closed it with a piece of cork through which passed a narrow glass tube. This tube, at first horizontal, is bent upwards, and its terminal part is so shaped as to serve both as a reservoir and as a funnel for the experimental liquid. When the apparatus is full and ready to work, the liquid column reaches a height of about 3 ft.

The trees subjected to experiment were pears of the varieties " Doyenné de juillet ", " Passe-Crassane ", " Beurré Hardy ", " Beurré Damanlis " and " Doyenné de Comice ".

The fairly satisfactory results obtained led the Authors to the conclusion that citro-ammoniacal pyrophosphate of iron used under the conditions set out does not form any precipitate with tannins, readily diffuses through the ligneous tissue and is consequently one of the salts of iron to be preferred for effectively dealing with chlorosis in fruit trees.

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(1) See *B.* Jan. 1912, No. 223. (*Ed.*).

BACTERIAL AND FUNGOID DISEASES

FUNGOID DISEASES.

574 COLLINGE, WALTER E. **Root and Stem Rot** (***Rhizoctonia violacea* Tul.**). — *Second Report on Economic Biology*, pp. 46-47. Birmingham, 1912.

Great Britain

In June last (1911) a serious outbreak of this disease on upwards of ninety acres of potatoes was inspected in Staffordshire.

The disease is due to a fungus that appears under many forms and names, and attacks a great variety of plants, *e. g.* potatoes, asparagus, beet, bean, carrot, cabbage, cauliflower, clover, lettuce, lucerne, mangels, radish, pea, tomato and a variety of bulbous plants and weeds; it does not touch cereals.

Although the mycelium behaves in a slightly different manner, and presents a modified appearance when growing on different hosts, infection experiments have proved that it in every case belonged to one and the same species.

The fungus lives in the soil, but, so far as is known at present, it never fruits; it is spread and propagated by the formation of little concentrated masses of mycelium. These may be very small and attached to the surface of the tuber, or they may be as large as a pear and remain in the soil, free from the roots, and serve as centres of future infection.

In some cases, little injury is done to the potatoes, in others the stems and tubers rot and very serious losses ensue. Usually the disease spreads over a wider area each year.

There are some points in connection with the life-history and habits of these fungi which at once point to a remedy, *viz*:

1. They are unable to develop excepting in the presence of an acid.

2. They flourish best in sour, badly drained, and poorly aerated soils.

3. As the fungus makes use of weeds as food, when a cereal crop is on the land, it is advisable to keep these down.

4. All diseased haulms or tubers should be burnt.

5. Liberal applications of ground unslaked lime will destroy the fungus and sweeten the soil.

6. The cessation of all acid manures is advisable.

7. All purchased seed should be obtained from dry, elevated districts and should be carefully examined to see that it is free from the small sclerotia or concentrated masses of mycelium.

FOËX, ET. **Note on the Modes of Hibernation of the Vine Oidium.** (1). (Notes sur les modes d'hibernation de l'Oïdium de la Vigne). — *Le Progrès agricole et viticole*, 33e année, No. 2, pp. 47-51. Montpellier, 14 Janvier 1912. 575

The Author mentions that as it is almost proved that the oidium of the vine has lived for a long time in Europe in the absence of perithecia (*Uncinula necator*), and that in certain countries it is still maintained under these primitive conditions, the oidium itself must possess other forms of hibernation than the perithecia. France

The Author adds that in the buds of the vine he found neither the mycelium of *U. necator*, which, according to Viala, Wortmann, Istvanffi and Ravaz, ensures the perpetuation of the parasite, nor the conidia fixed in the angles of the August shoots, which, according to De Bary and Viala, play the same part as the mycelium.

On the basis of his own investigations the Author concludes that the question of the modes of hibernation of the vine oidium still remains very obscure.

ARNAUD. G. and FOËX, ET. **On the Form of the Oak Mildew in France.** (Sur la forme de l'Oidium du Chêne en France). — *Comptes rendus hebdomadaires des séances de l'Academie des Sciences*, Tome 154, No. 3, pp. 124-127. Paris, 15 Janvier 1912. 576

For the last few years an *Oidium* (1), not accompanied by the perfect form (perithecia) has been growing in abundance on oaks. This form was, however, found on the 30th December 1911 at France

(1) See *B* Feb. 1911, No. 603; March 1911, No. 990; and June 1911, Nos. 1891-1893. (*Ed.*).

(1) See *B*. Nov. 1910, pp. 167 ; Dec. 1910, pp. 365 and 370; Jan. 1911, No. 331; March 1911, No. 998; April 1911, No. 1298; and June 1911, No. 1892; (*Ed.*).

Cavillargnes (Gard) on *Quercus sessiliflora* Smith; the Authors consider that the perithecia examined belong to *Microsphaera quercina* (Schweinitz) Burrill, which has long been known as a parasite of oaks in North America. They state that *Microsphaera quercina* has long existed in Europe, but believe that the fungus, formely localised or rare, has considerably extended and developed under the influence of slight alterations of environment favourable to its evolution.

577 MÜLLER, KARL. **American Gooseberry Mildew and Oak Mildew in the Grand-Duchy of Baden.** (Zur Ausbreitungsgeschichte des amerikanischen Stachelbeermehltaus in Baden und einige Bemerkungen über den Eichenblattmehltau). — *Zeitschrift für Pflanzenkrankheiten*, XXI. Bd. Heft 8, S. 449-454, 1 Textfigur. Stuttgart, 30 Dezember 1911.

Germany: Grand-Duchy of Baden

According to the study made by the Author of the extent to which *Sphaerotheca mors-uvae*, discovered in 1908, has spread in the Grand-Duchy of Baden, it appears that in the central part of the Grand-Duchy there is a clearly localised centre of infection, and all the other infested points towards Freiburg, Neustadt, Marzell and Uberlingen must be regarded as sporadic centres. The infested gooseberry bushes come from North Germany.

The disease is only spread by the transfer from place to place of gooseberry bushes on the branches of which the ascospores of the fungus hibernate; the spread of the disease by conveyance of the conidia in summer by the wind is of local extent only.

With reference further to oak mildew, likewise reported for the first time in 1908 in the Grand-Duchy of Baden, the Author points out that this fungus also attacks beech (*Fagus silvatica*) in the Grand-Duchy.

578 ARNAUD, G. and LAFONT, F. **The Biology of *Nectria cinnabarina* and *Coryneum Mori*.** (Accidents météorologiques et maladies du Mûrier). — *Annales de l'Ecole nationale d'Agriculture de Montpellier*, nouvelle série, tome XI, fasc. III, pp. 169-215, fig. 1-25. Montpellier, Janvier 1912.

France. India. Japan

The Authors, at Montpellier, have studied the development on the mulberry of *Nectria cinnabarina*, which in some years causes considerable havoc. To the particulars regarding *N. cinnabarina* the Authors add facts concerning *Coryneum Mori* which occasionally

attacks the mulberry, but only in India and Japan, these particulars being taken from a study by Butler. The growth of *Nectria* is probably, like that of *Coryneum*, connected with the action of spring frosts on the young buds in process of development. According to the Authors, the fungus makes its way into the branches through the frost-bitten buds.

Nectria seems to find entry into these buds during the rainy periods occurring from the middle of May to the end of June. Its growth requires a great deal of moisture; its injuries stop with the beginning of summer drought. The fungus which has penetrated a branch develops rapidly; its mycelium invades the external wood, the bast and the bark, the two latter portions being completely disorganised by the mycelium. The growth of the mycelium and the alteration of the tissues calls forth a reaction by the plant which forms thyloses in the vessels for some length. The cicatricial tissues thus formed prevent the rise of the sap towards the end of the branch, which withers and dies. Sometimes the mycelium, which may have a perennial life of several years, gradually makes its way down towards the base of the branch and invades the living tissue.

At the time when the end of the branch is completely withered the fungus has only extended its mycelium a length of about 10 cm. (4 inches); the rest is absolutely free from infection. If the outside bark is lifted the healthy green part is observed beneath, and then the brown attacked part. The bark of the dry end of the branch, is grey and dry inside. In the brown part the fructifications of the conidial form of *Nectria* are formed, known as *Tubercularia vulgaris*, the only ones observed on one year-old branches.

Later on, the second fruiting of the fungus takes place, known under the name of *N. cinnabarina*. The Authors have never observed it in the mature state on the mulberry.

According to the Authors, *Bacterium Mori*, *Gibberella pulicaris* and *Botrytis cinerea* have no connection with the disease under study.

As regards remedial measures, though the elimination of the parts attacked with the object of destroying the infecting germs is ineffective, this will not be the case when the operation is carried out with a view to preventing the parasite from going down from the parts attacked to the healthy parts. In cultivation on a large scale, the removal of the branches attacked is sufficiently secured by the usual pruning which is done every two years.

In nurseries not regularly pruned, when the disease rages, it is essential, in the autumn or in the following spring, to remove all the dead parts, and for greater safety, 10 to 20 cm. (4 to 10 inches) of the healthy part.

In countries subject to frost, over-early varieties of mulberry should also be got rid of.

The Authors likewise advise trying Bordeaux mixtures.

According to Butler, the means of dealing with *Coryneum Mori* consist in removing the parts affected as well as the dead or weak wood and burning the whole immediately, in order to get rid of the centres of production of the spores. Beyond this more careful pruning must be carried out, leaving perfectly clean cuts.

According to the Authors, the burning of the dead wood and the pruned wood does not ensure complete destruction of the fungal spores.

The removal of the diseased or weak branches will be effective in preventing the mycelium from attacking the branches still healthy.

Butler has observed that the practice followed in Cashmere of distributing mulberry branches and not detached leaves to silk-worms facilitates the propagation of the parasite, because the branches are cut roughly, regardless of the condition in which they leave the plant and the injuries caused. He adds that silk-worm rearing on this method offers no perceptible advantage over the method generally used in Europe, which consists in rearing the worms on detached leaves.

The Authors dispute this latter view of Butler, but they notwithstanding acknowledge the advantages presented by methodical and careful pruning from the point of view of production and crop of the leaves; finally, they urge, with the object of preventing the entry of other parasites (*Polyporus*, for instance), that care should be taken, in countries where worms are reared on whole branches, to trim the cuts after the first rough cutting.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS.

REED, HOWARD S. and COOLEY, J. S. ***Heterosporium variabile* Cke., its Relation to *Spinacia oleracea* and Environmental Factors.** — *Centralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten*, 32 Bd., No. 1-2, S. 40-58, 9 Fig. i. Text. Jena, 5 Dezember 1911. 579

Heterosporium variabile Cke. infests the spinach fields in Virginia.

From the Authors' investigations it appears that this fungus is an occasional parasite, and that it generally attacks spinach plants which are already suffering from and enfeebled by other pests.

United States: Virginia

Peronospora effusa Grev. found in some spinach plantations precedes the *Heterosporium* infection. The injuries caused by winter frost likewise predispose spinach to the disease.

In the detailed study of the growth of the fungus, the Authors have, *inter alia*, brought out the fact that *Heterosporium* acquires great variability of form and behaves differently according to the different physiological conditions. As soon as it is isolated, it grows with difficulty as a saprophyte, but, in the course of time, changing its shape and its behaviour while remaining a saprophyte, it develops luxuriant growth.

WRIGHT, R. PATRICK. **Report on an Experiment on the Prevention of "Finger-and- Toe" (*Plasmodiophora Brassicae*) (1) in Turnips. Conducted at the College Experiment Station 1903-1909.** — *Report of the West of Scotland Agric. College.* Glasgow, 1911. 580

The experiment of which this report gives an account, was carried out on a field on the College Experiment Station, Holmes Farm, Kilmarnock.

Scotland

(1) See *B.* Nov. 1910, p. 162; Feb. 1911, No. 601; Aug.-Sept.-Oct., 1911, No. 2984. (*Ed.*).

The soil consists of a light loam in good condition, but poor in lime.

In 1901, a section of the field was sown with a crop of rape and the plants were found to be infected with "finger-and-toe" disease.

A series of small plots of $\frac{1}{400}$th part of an acre each were marked off in the following winter on the infected land, and a crop of turnip manured with superphosphate grown in 1912.

The crop was again badly attacked by the disease.

When the roots were raised in autumn, the diseased parts were carefully and uniformly spread over the land, so that the whole area intended for experiment should be completely and equally infected.

Various means were employed for the purpose of protecting succeeding turnip crops from the attacks of the fungus:

(1) Ashes.
(2) 2 tons lime per acre.
(3) 4 » » » »
(4) 1 ton » » »
(5) Naturally slaked lime.
(6) Ground lime.
(7) Spring v. autumn application of lime.
(8) Sulphate of copper.
(9) Kainit.

The following conclusion may be drawn from this experiment.

(1) The destruction of the turnip crop by finger-and-toe disease can, to a certain extent, be prevented by the application of suitable dressings of lime.

(2) On land much infected, dressings of lime of less than two tons per acre cannot be relied on to produce much effect.

(3) On land much infected, applications of four tons per acre are more successful, but will not entirely destroy the disease nor save the crop.

(4) Lime applied in the drills in spring is much less effective in preventing the disease than when put on the land in the preceding autumn.

(5) Small dressings of lime, applied either in autumn or in spring, have little effect.

(6) Lime slaked in small heaps by atmospheric moisture is distinctly less effective in preventing the disease than the same lime (CaO) slaked by pouring water over it when fresh from the kilns and spreading it on the land while it still remains in a caustic condition.

(7) Ground lime is more expensive and no more effective than an equal quantity of properly slaked lime.

(8) Sulphate of copper, applied at the rate of half a ton per acre, has no immediate effect in saving the turnip crop from the "finger-and-toe" attack, but is ultimately injurious to the disease fungus.

(9) Kainit applied in the same quantity in spring to the turnip crop has no effect in protecting it, but its subsequent action in the soil is detrimental to the "finger-and-toe" fungus and beneficial to succeeding turnip crops.

(10) Ashes, probably on account of the alkaline condition they produced in the soil, proved to be a complete preventive against "finger-and-toe" attack. A heavy dressing of coal ashes was used.

KUSANO, S. **On the Chloranthy of *Prunus Mume* caused by *Caeoma Makinoi*.** — *Journal of the College of Agriculture, Imperial University of Tokyo*, Vol. II, No. 6, pp. 287-326, Plate XVII-XVIII, 3 Text fig. Tokyo, April 25th, 1911. **581**

In the Botanical Garden of the College of Agriculture in Tokyo, the Author observed numerous specimens of *Prunus Mume* attacked by *Caeoma Makinoi*.

This fungus, living as a parasite on the flower buds, calls forth in the latter various anomalies connected with the phenomenon of chloranthy. The protoplasm of organs not yet differentiated reacts to the stimulus of the mycelium, that is, it determines alterations in the development of these same organs. **Japan**

The appearance of chlorophyll, accompanied by other internal and external modifications of the flower organs, extends *pari passu* with the extension of the mycelium.

The anomalies are more deeply seated according as the fungus develops more vigorously on the host plant. If the bud is attacked by the parasite in the first stages of its development, it is converted into a branch, while chloranthy does not make its appearance or is incomplete if the growth of the bud is already far advanced. Before the phenomenon can appear in its entirety, the fungus must attack the bud at a perfectly definite moment of the latter's evolution.

Bud-rot, *Thielaviopsis ethacetica*. *Botryodiplodia* sp., and *Pestalozzia Palmarum*, Diseases of the Cocoanut. — See below, No. 598. **582**

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

583 TEUSCHER, A. **Dock (*Rumex Patientiae*) in Clover Fields.** — *La Terre Vaudoise*, 4e année, No. 4, pp. 43-44. Lausanne, 27 Janvier 1912.

At St. Urban, near Langenthal, a large clover field, formerly of luxuriant growth, has recently been very seriously invaded by docks (*Rumex Patientia*).

Switzerland

Besides taking up room at the expense of the clover, this plant is carefully shunned by cattle. Its seed retains its vitality and fructifies even after being kept in solid and liquid manure. After a lapse of four years, dug to a depth of 30 cm. in the soil, it still preserves its germinating power, so much so that it is very difficult to obtain clover seed free from *Rumex*.

To control this weed, its root must be completely exterminated. A very small shred of these roots, which successfully withstand sun, frost and ploughing in, suffices for the rapid propagation of the species. This is also contributed to by the circumstance that the Berne soils are highly nitrogenous and that rotation of crops is rather rare. In less fertilised soils the plant shows a less vigorous growth and is not so dangerous. Still, it is desirable to destroy at once the isolated roots of *Rumex*, in order to avoid having to deal with the weed when more widespread; but above all thorough care should be taken that clover seed contains no dock seeds; the latter may be easily recognised by their red colour and triangular shape, but they are at the same time difficult to separate from the good seed. Nevertheless, there are sorting machines which supply completely purified clover seed.

The propagation of dock may also be prevented by taking care not to throw on stable litter the coarse fodder remains left in the crib, and also by being careful to pull up the young dock plants when their roots are still straight. Finally, when clover is to be kept for seed, *Rumex* plants must be cut and removed from time to time.

INSECT PESTS

GENERALITIES.

GRANDORI, REMO. **Contribution to the Embryology and Biology of *Apanteles glomeratus* (L.) Reinh., a Parasite of the Larva of *Pieris Brassicae* L.** (Contributo all'embriologia e alla biologia dell'*Apanteles glomeratus* (L.) Reinh. Imenottero parassita del bruco di *Pieris Brassicae* L.) — *Redia*, Vol. VII, fasc. II, pp. 363-427, tav. XIII-XVI. Firenze, 31 Dicembre 1911. 584

This is a study on the life history of *Apanteles glomeratus* (L). Reinh., Hymenoptera, which the Author found widely and equally distributed in the provinces of Rome, Pisa, Catania, Palermo and Padua, as a parasite of the larva of *Pieris Brassicae* L. (1). **Italy**

COLLINGE, WALTER E. **The Mangel or Beet Fly (*Pegomyia Betae* Curtis)** (2). — *Second Report on Economic Biology*, pp 13-17. Birmingham, 1912. 585

For many years past, economic entomologists, farmers, and others have noticed the spread and increasing numbers of a small dipterous fly which, at the present time, is inflicting a very serious loss upon growers of mangels or beet. **Great Britain**

Numerous suggestions have been put foward as to the control of this insect, but in spite of these, it has continued to increase and devastate annually a large acreage.

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(1) In addition to *P. Brassicae*, *Apanteles* is also a parasite of numerous other Lepidoptera: *Macroglossa stellatarum* L., *Notodonta Zic-zac* L., *Aporia Crataegi* L., *Smerinthus Populi* L., *Zygaena ephialtes* L., *Bembecia hylaeiformis* Lasp., *Abraxas grossulariata* L., *Phigalia pedaria* F., *Vanessa Urticae* L., See: GRANDI, G. *Dispense di Entomologia agraria*, p. 441. Portici, 1911. (*Ed.*).

(2) See *B.* April 1911, No. 1307; and June 1911, No. 1941. (*Ed.*).

Acting upon the suggestion of certain growers, the writer has made a thorough and detailed study of this insect in its various stages, and has carried out a number of experiments.

It appears to have first been noticed in this country in 1846.

Carpenter mentions that, in addition to the direct injury to the plants by the leaves, the former were possibly rendered liable to attack by the rot-fungus (*Phoma Betae*).

The species is generally distributed over the British Isles.

Allied species found on various weeds are frequently mistaken for it, as well as the celery fly (*Acidia Heraclei*).

Food Plants.

In addition to the beet and mangel, *Pegomyia Betae* is also found on species of dock, the goose foot (*Chenopodium album*), and sowthistles (*Sonchus arvensis* and *S. oleraceus*).

Life-History and Habits.

The eggs are deposited beneath the seed leaves and leaves.

On the former they usually occur singly or in pairs, very rarely in clusters; on the ordinary leaves, however, clusters of four to ten are common.

In colour the egg is white; it is elongated, oval and characteristically marked. The length is about 1 mm.

On hatching, the young larvae at once commence to make their way into the mesophyll of the leaf.

There are probably four moults; the full-grown larva measures from 8-10 mm. in length.

The puparium is usually found in the soil an inch or so beneath the surface, but occasionally it is seen within the leaf blisters.

Two or three broods appear in the year.

The pupae of the last brood remain in the soil during the winter; occasionally, however, they develop and hibernate.

As winged insects, most die before the winter sets in, but hibernation is by no means uncommon.

Remedial Measures.

Wherever there has been an attack of this insect, the land should be treated with ground unslaked lime, 15 cwt. per acre, and deeply turned in.

Various fluids have been tried to prevent the flies laying their eggs on plants. The following has proved the most effective:

Paraffin	1 gall.
Soft Soap	½ lb.
Ammonia	4 oz.
Water	10 gall.

This should be sprayed on the plants towards the end of May.

Top-dressing with nitrate of soda and common salt has also proved valuable in forcing on plants. The quantities per acre are from 1 to 1 ½ cwt. of nitrate of soda and 2 to 3 cwt. of salt.

Any fertilising substance which favours rapid and healthy growth is valuable.

As the outer leaves are usually the ones to be first attacked, it is well on small areas to remove and burn these.

DEL GUERCIO, GIACOMO. **Some Aphides in the Iberian Peninsula and other Localities.** (Intorno ad alcuni Afiditi della Penisola Iberica e di altre località raccolti dal prof. T. S. Tavares). — *Redia*, Vol. VII, fasc. II, pp. 296-333, 30 figg. nel testo. Firenze, 31 Dicembre 1911. **586**

This note contains a list of aphides, partly already known and partly new to science, collected by Professor T. S. Tavares in the Iberian Peninsula and other localities on numerous plants, some of which are likewise new as hosts of aphides. **Spain**

Morphological particulars are given concerning the species thought to be new. Among these latter there is *Anuraphis Melampyri*, which lives on a species of the genus *Melampyrum* (1), and *Macrosiphoniella Chrysanthemi*, which causes notable injury to forced chrysanthemums.

BESSEY, ERNST A. **Root-Knot and its Control.** — *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin No. 217*, p. 88, 3 text fig., 3 pl. Washington, November 11, 1911. **587**

The disease known in the United States as "Root-knot", "Beaded Root-knot", "Root-gall", "Eelworm-disease", "Bigroot" etc., is characterised by root swellings often followed by the death of the plant. This disease is produced by *Heterodera radicicola* (Greef) Müll. This Nematode, originating probably from the tropics, is to-day disseminated throughout almost all parts of the temperate zone. The number of plants which are hosts of *Heterodera* is estimated at about 480, and among them are many field and garden crops. The biological cycle of this parasite is accom- **United States**

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(1) Some species of *Melampyrum* cause damage to sowings of wheat, barley, rye and oats; entire crops may be destroyed, or at any rate greatly injured. See P. VOGLINO, *Patologia vegetale*, p. 10, Torino, 1905. (*Ed.*).

plished in four weeks or more according to the soil temperature. During the larval stage the Nematode invades the host plant and then becomes motionless, enlarges, and undergoes a kind of transformation; the males become wormlike in appearance, while the females on the contrary take the shape of a pear or a bottle. Each of the latter lays 500 eggs or more.

The *Heterodera* mostly passes the winter in the larval state in the soil, but may hibernate in the roots of perennial plants in a more advanced stage of development.

The following conditions contribute to the rapid multiplication of the Nematode: some degree of heat, a loose soil, moisture, and an abundance of nutritive substances.

The spread of the parasite may take place in different ways. Especially, the larvae themselves, moving on the ground, may pass from one point to another; they are likewise conveyed from field to field by implements, animals, men, carts, etc., and also by means of water, wind, and finally the plants and the manures brought to the fields. In hot-houses and nurseries *Heterodera* is effectively controlled by high pressure steam. The infected earth must be completely removed and the holes carefully cleaned. When the use of steam is impossible, the infected earth must, during the winter, be exposed alternately to cold and heat, and especially to dryness. If the land bears perennial plants, the parasite may be dealt with by the aid of a solution of formaldehyde (1 part in 100 parts of water), but the latter must be used cautiously.

In fields occupied by perennial plants the application of chemical substances has not given satisfactory results in the destruction of the Nematode. Where the trees are to be removed the parasite can be controlled by the use of carbon disulphide in the proportion of 3 to 4 oz. per square yard, distributed overnine holes per square yard, the holes being about 6 to 12 inches deep. Carbon disulphide cannot give reliable results when the land is already occupied by trees.

A good dressing and careful tillage will assist in controlling *Heterodera*, in the sense that the roots of the plants will penetrate deeper into the soil where the Nematode does not abound, or where it only comes in the adult state before the characteristic swellings have formed on the roots.

It will be well to avoid growing plants possessing a low degree of resistance.

In infected land not bearing perennial plants, it is first of all recommended to stop growing crops for two years, and afterwards to plant resisting species; and to use manures, especially those con-

taining potash except where potash is already found in large quantities in the soil; to flood the soil for some weeks; to till and drain the soil when rain is not anticipated; and finally by suitable dams, to prevent healthy land being invaded by water flowing from fields where the presence of the Nematode has been noted. The best means however consists in obtaining, by means of selection and cross-fertilisation, types of plants capable of resisting the disease.

MEANS OF PREVENTION AND CONTROL.

BERLESE, ANTONIO. **The Behaviour of *Prospaltella Berlesei* in Italy.** — (Come progredisce la *Prospaltella Berlesei* in Italia). *Redia*, Vol. VII, fasc. II, pp. 431-461. Firenze, 31 Dicembre 1911. **588**

The following conclusions may be drawn from the observations made in Italy by the writer as to the behaviour of *Prospaltella Berlesei* in combating *Diaspis pentagona*.

1. *Prospaltella Berlesei* adapts itself perfectly to the climate of Upper Italy; it is very actively propagated in regions where winter is less lengthy and milder (Genoa, and environs of the Garda Lake), and more slowly in the regions with severer winters (Piedmont), where it probably goes through one or two generations less than in the hotter parts. **Italy**

2. The winter colds, even the most intense, do not hurt *Prospaltella*.

3. The energy of spread of this beneficial insect is very considerable.

4. The behaviour of *Prospaltella* is everywhere such that according to the writer, it is certain to prove as useful as had been expected.

FRENCH, C. junior. **Beneficial Insects: Parasitic Wasps.** — *The Journal of the Department of Agriculture of Victoria, Australia*, Vol. IX, Part 12, p. 818. 1 Pl. Melbourne, December 1911. **589**

The Author reports that *Megalyra fasciipennis*, belonging to the Hymenoptera and commonly called the "Long-tailed Wasp" in Victoria, perforates live wood by means of its ovipositor and deposits its eggs in the body of the grubs of beetles which injure forest and fruit trees, chiefly the Long-horned Beetles and Jewel Beetles. **Australia: Victoria**

590 **Destruction of Grey Worms (*Agrotis segetum*) and Wireworms *Elater segetis*), injurious to Tobacco in Canada.** — See above, No. 511.

Canada

591 TRUELLE, A. **Does Lime-washing Fruit Trees destroy Insects.** (Le chaulage des arbres fruitiers a-t-il une action insecticide?) — *Journal d'Agriculture pratique*, 76e année, No. 4, pp. 118. Paris, 25 Janvier 1912.

It was long believed that the practice of liming the trunks of fruit trees was an excellent method of destroying the animal and vegetable parasites of these trees.

France

On the strength of experiments conducted of late years, the Author believes that liming exerts no insecticidal effect on fruit trees, but that its action is rather to protect them against cold and heat.

With the addition of sulphate of copper and sulphate of iron the lime may be used for checking vegetable parasites (mosses, lichens and microscopic fungi).

For keeping animal pests under, recourse must be had to other methods of known efficacy.

INSECTS INJURIOUS TO VARIOUS CROPS.

592 G. D. G. **Insect Pests of Rice** (1). (I Friganeidi nuocciono al Riso. I Tafani del Riso. Le larve delle Tipule nocive al Riso). — *Redia*, Vol. VII, fascicolo II, pp. 466-467. Firenze, 31 Dicembre 1911.

The attention of rice growers is directed to the damage caused by *Phryganea striata* and *Limnophilus rhombicus*. These insects are commonly known in Italy under the names of "farfalle acquatiche" and "farfalle pieghettate" when adult, and of "bruci acquatici"

Italy: Emilia

(1) See also *B.* Nov. 1910, p. 175; Jan. 1911, No. 305; Feb. 1911, No. 675; March 1911, No. 1054; April 1911, No. 1318; Jan. 1912, No. 262. (*Ed.*).

and " vermi timorosi " in the larval state. Failing other material they utilise the leaves of the rice plant which grows in the mud at the bottom of rice fields for the construction of the cases into which they withdraw, when passing into the nymphal state. It is not long consequently before large blanks are observed in the rice fields just sown, so that sowing has to be repeated several times.

This is what happened last year at Molinella (Bologna).

It is not difficult to recognise these insects in the rice fields, collect them and destroy them.

In the same rice fields at Molinella, the young plants sustained great injury from the grubs of *Tabanus dubius* Fab. and other insects of the genus *Tipula*.

G. D. G. ***Guerrinoccus Serratulae*, a Pest of Cultivated Leguminosae.** (La Cocciniglia farinosa delle Baccelline). — *Redia*, Vol. VII, fasc. II, pp. 468-470. Firenze, 31 Dicembre 1911. 593

This scale insect attacks a number of herbaceous and woody plants, and among others various leguminous plants to which it does great damage: *Vicia Faba*, *Medicago sativa*, *Trifolium incarnatum*, *T. pratense*, etc. **Italy**

It passes from the herbaceous to the woody plants during fine weather and from the latter to the former from the end of autumn.

To prevent these scale insects from laying eggs on leguminous plants, the latter must be made to mature early by suitable methods of cultivation: by earlier sowing, the use of early seed and mineral fertilisers.

When the scale has invaded or is on the point of invading woody plants (vines, olive trees, elms etc.), the trunks must be stripped of their bark and the latter burnt; then an insecticide containing tar must be used, or the infected trunks must be carefully cleaned with a brush.

COLLINGE, WALTER E. **A New Pest of Mangels and Beet (*Cionus Scrophulariae* Linn).** — *Second Report on Economic Biology*, pp. 7-10. Birmingham, 1912. 594

In May last, Mr W. B. Grove submitted to the writer for identification, a number of larvae feeding on the underside of the leaves of the knotted figwort (*Scrophularia nodosa* Linn).

Shortly afterwards, the same larvae were received on mangel and beet leaves to which they were doing considerable damage. **Great Britain**

Mr Collinge cannot find that this insect has previously been recorded as attacking any cultivated plants.

Economic Importance.

Hitherto, the insect has not been regarded as of economic importance, except in so far that it to a certain extent keeps down the knotted figwort which is a weed. But now that it has been found injuring the mangel and beet, two plants which cover a large acreage and which are valuable as food materials, the pest assumes a position of great economic importance. Whether or not, this insect will forsake its original food plant for those of cultivated crops, remains to be seen.

It frequently happens that such is the case in the change of a food habit of this kind, and it is therefore doubly important that those individuals that migrated from the knotted figwort to the beet and mangel should be exterminated; this is believed to have been done in the present cases.

Fowler (*Coleoptera of the Brit. Islands*, 1891, Vol. V, p. 323) describes it as rather local, but common where it occurs.

Food Plants:

Hitherto the species of this genus have been regarded as feeding only on plants belonging to the order *Scrophulariaceae*, particularly on species of *Verbascum* such as *V. Thapsus*, the great mullein, and *V. nigrum*, the black mullein, *Scrophularia nodosa*, the knotted figwort, and *S. aquatica*, the marsh figwort; its occurrence, therefore, on the mangel and the beet is certainly strange, but is only another instance of the change of feeding habits so common amongst insects.

Life-History and Habits.

Mr Collinge did not see the eggs, but they were probably laid on the undersides of the leaves early in May. The larvae received by him on June 15th were variable in size. They usually commenced to feed at that portion of the leaf nearest the petiole, eating away the two layers of parenchyma; later they returned and perforated the leaf by feeding upon the upper layer of the epidermal cells. The imagines appeared on July 10th and 11th; it was not proved that the beetles themselves fed upon the leaves.

Remedial Measures:

The food plants, such as the knotted figwort, etc., should be destroyed.

As the beetles probably hibernate in hedgeside debris, all such material should be burned.

The larvae frequently fall off from the underside of the leaves on the ground; these might be destroyed if again found attacking cultivated crops, by scattering soot and lime or kainit on the surface of the ground.

COLLINGE, WALTER E. **The Cabbage Aphis (*Aphis Brassicae* Linn.).** *Second Report on Economic Biology*, pp. 4-5. Birmingham, 1912. **595**

Great Britain

Undoubtedly the greatest and the most objectionable pest attacking the cabbage plant is this aphis.

Often the actual amount of damage done is small, but the plants become unmarketable owing to the slimy mass of insects and their excreta.

Life-History:

The eggs are deposited on the under-face of the leaves of wild species of *Brassica*, cabbage, Brussels sprouts and other cruciferous plants at the end of October, or early in November, and hatch out early in May. It is not until the year has well advanced that they do any considerable damage, although plants received from Cheshire in July 1905 were blistered all over, most of the leaves having many yellow patches on them.

In the early part of the year, the larvae are covered with a mealy-like substance, and seem to spread slowly.

There is active migration late in the summer from such plants as shepherds' purse (*Capsella Bursa-pastoris*), charlock or wild mustard, etc.

Indeed it would seem as if they prefer the cultivated plants in the autumn. Here they excrete large quantities of a sticky honey-dew, which covers the leaves and stems, making most plants unmarketable, and if largely infested, killing them.

In spite of the beneficial work of certain hovering flies (*Catabomba Pyrastri* Linn. and *Syrphus Grossulariae* Meig.) and Ladybird beetles, once they attack a plant they seem to flourish.

None of the remedies known of by the writer are of any value except where employed on a small scale.

For gardens, or small areas, three or four weekly applications of ¼ lb. of soft soap to 1 gallon of water will usually keep the plants clear.

All cruciferous weeds should of course be destroyed.

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(1) See *B.* May 1911, No. 1566. (*Ed.*).

596 **Spraying for Big Bud of Black Currants** (1). — *The Journal of the Board of Agriculture*, Vol. XVIII, No. 10, pp. 847-848. London, January 1912.

Great Britain

One of the officers of the Board of Agriculture carried out some experiments at Harvington (Worcestershire) to test the efficacy of various sprays for combating big bud of black currants.

The sprays used were:

(1) A dry mixture of lime and sulphur (1 part of air-slaked lime to 4 parts of sulphur).

(2) Quassia and soft soap (2 lb. of quassia chips boiled for 2 hours, 1 lb. of soft soap and 10 gals. of water);

(3) Soft soap alone at the rate of 1 lb. of soft soap to 10 gals. of water.

Sprayings with the above mixtures were carried out on the 20th April, and 4th and 25th May.

A microscopical examination of big buds of the diseased black currants carried out in September made it evident that the sprayings were in some degree effective, although they had not completely destroyed the *Phytoptus*.

Of the three mixtures tried, the lime and sulphur proved the most effective. The untreated plants had 66.7 % of diseased buds, while those treated with lime and sulphur had only 45.5 % of diseased buds.

597 G. D. G. **The Cicada as a Pest of Olive Trees and Other Cultivated Plants.** (La cicala è fra i nemici dell'Olivo e di altre piante coltivate). *Redia*, Vol. VII, fasc. II, pp. 465-466. Firenze, 31 Dicembre 1911.

Italy: Calabria, Apulia

According to the observations made in Calabria and Apulia, the common cicada attacks the branches of the olive tree, which become stunted and then shrivel during the summer, to the great detriment of the flowers and fruits brought forth.

Nor is this all; the insect attacks the olive direct and even in many cases the branches of pear, apple, almond and apricot trees; in this way it causes injury which is not always observed, but which is very grave under certain conditions of time and season.

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(1) See also *B.* June 1911, Nos. 1941 and 2019. *(Ed.)*.

598 G. B. **Enemies of the Cocoanut Tree** (1). — *Bulletin Agricole du Congo Belge*, Vol. II, No. 3, pp. 512-528, figg. 243-257; No. 4, pp. 723-731, figg. 336-339. Bruxelles, Septembre-Décembre 1911.

India, Malaysia, Africa, etc.

A detailed description of numerous pests, animal and vegetable, of the cocoanut tree in various countries (India, Malaysia, Africa, etc.) indicating means of control.

The insects are the most terrible enemies of the cocoanut tree. We may mention among others the termites, and some kinds of ants causing havoc to the plants and the cocoanuts planted in the ground. To deal with these it is advised that salt or ashes be mixed with the earth, or that the nuts should be dipped before planting in a solution consisting of 300 grammes of sugar, a little arsenic and flour, and 10 litres of water.

Moreover, various beetles damage the cocoanut tree to such an extent as to kill it, in consequence of the galleries they tunnel in the stem of the plants. Among them we may mention: *Oryctes rhinoceros* L., *O. boas*, *O. monoceros* Ol., *O. Preussi* Kolbe, *O. Anglias*, *O. colonicus* Coq., *O. insularis* Coq., *O. Pyrrhus* Burm., *O. Ranavalo* Coq., *O. simiar* Coq., *Pimelopus tenuistriatus* Aulm., *P. Preussi* Aulm., *P. robustus* Aulm., *P. pygmaeus* Aulm., *Camelonotus quadrituber* Fairm., *Strategus alveus* F., *Xylotrupes Lorquini*, *Scapanes australis* Boisd., *S. grossepunctatus* Sternbg., *Trichogomphys Semmelincki*, *Oryctoderes latitarsis* Burm., *Rhinchophorus ferrugineus* Fabr., *R. Phoenicis*.

The best method of controlling these insects consists in carefully collecting them and afterwards destroying them. Lamp-traps may also be used.

Other beetles, on the contrary, chiefly attack the leaves of the cocoanut tree. We may mention: *Brontispa Frogattii* Sharp, *Promecotheca antiqua* Weise and *P. opacicollis* Gestro. The *Brontispa* has natural enemies in the form of some Ichneumons to which it would be desirable to give facilities for multiplication.

Among the Coleoptera there further appear as enemies of the cocoanut tree *Euritrachelus intermedius* Gestro, and *Mycterophallus xanthopus* Boisd.

Among the Lepidoptera the cocoanut tree also has enemies in the form of a representative of the family of the *Gelechiidae*, and the

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(1) See *B.* Nov. 1910, p. 161; Dec. 1910, p. 368; Feb. 1911, No. 689; June 1911, Nos. 2004-2005; July 1911, No. 2040; Aug.-Sept.-Oct. 1911, No. 2688. (*Ed.*).

larvae of *Padraona chrysozona, Thosea cinereomarginata, Thosea sp., Erionota thrax, Brachartona catoxantha*, etc. The destruction of some of these insects is promoted by their natural enemies. They may also be destroyed direct or by employing insecticides.

Locusts may likewise damage the plantations when they appear in large numbers.

Again, among scale-insects there is a rather formidable enemy, *Aspidiotus destructor* Sign., which is chiefly kept under by some ladybirds and also by the use of insecticides.

Less numerous, but no less dangerous are the vegetable parasites of the cocoanut tree. The most widespread disease is certainly the Bud Rot, which is dealt with by means of Bordeaux mixture and by burning the parts of the plant affected.

Another cryptogamic disease attacking old cocoanut tree stems is that known under the name of Bleeding Disease, attributed to *Thielaviopsis ethacetica.*

The roots of the cocoanut tree are often invaded by a species of *Botryodiplodia.* Burning the dead parts and applying a lime, ash or dung dressing to the soil are effective remedies for this disease

The leaves of the young plants may be attacked by *Pestalozzia. Palmarum*, which is controlled by sprayings with Bordeaux mixture.

Other diseases of cocoanut leaves have also been pointed out, the causes of which are as yet unknown.

Among the pests producing a decline of yield, without however directly injuring the plant, and which are consequently only injurious to the planter's interests, the following must be pointed out:

1. Rats (*Mus Doriae, Opossum*), large numbers of which make their nests among the leaves of the plant, and gnaw the fruits away gradually: to destroy them rat poison must be used, and to prevent their climbing up the plant the stem must be fitted with metal rings.

2. Squirrels.

3. Monkeys (*Cynocephalus, Cercopythecus albigularis?, Galago* sp.?), which pierce the fruits and empty them of their contents. They are shot.

4. Bats, which cause damage similar to the foregoing and are dealt with in the same way.

5. Hyenas.

6. Birds, especially *Cacatua galerita*, which eat the pulp of the fruit.

7. A terrestrial Crustacean (*Birgus latro*) which feeds on the fallen fruit and those it manages to detach from a tree by climbing up the stem.

Wild swine as well as porcupines cause great mischief to the plantations, the former destroying the young plants in thousands and the latter gnawing the stem of the full grown trees till they are completely perforated. Against the former, successful use is made of arsenic mixed with foods (fruits, tubers etc.).

INTERNATIONAL INSTITUTE OF AGRICULTURE

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3rd YEAR - NUMBER 4

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THE INTERNATIONAL INSTITUTE OF AGRICULTURE

The International Institute of Agriculture was established under the International Treaty of June 7th, 1905, which was ratified by 40 Governments. Ten other Governments have since adhered to the Institute.

It is a Government Institution in which each Country is represented by delegates. The Institute is composed of a General Assembly and a Permanent Committee.

The Institute, confining its operations within an international sphere, shall:

a) Collect, study, and publish as promptly as possible statistical, technical, or economic information concerning farming, vegetable and animal products, the commerce in agricultural products, and the prices prevailing in the various markets;

b) Communicate to parties interested, also as promptly as possible, the above information;

c) Indicate the wages paid for farm work;

d) Make known the new diseases of plants which may appear in any part of the world, showing the territories infected, the progress of the diseases, and, if possible, the remedies which are effective;

e) Study questions concerning agricultural co-operation, insurance, and credit in all their aspects; collect and publish information which might be useful in the various countries for the organisation of works connected with agricultural co-operation, insurance and credit;

f) Submit to the approval of the Governments, if there is occasion for it, measures for the protection of the common interests of farmers and for the improvement of their conditions, after having utilized all the necessary sources of information, such as the wishes expressed by international or other agricultural congresses, or by congresses of sciences applied to agriculture, or agricultural societies, academies, learned bodies, etc.

The Institute publishes: *a*) a Bulletin of Agricultural Statistics; *b*) a Bulletin of Agricultural Intelligence and Diseases of

Plants; *c*) a Bulletin of Economic and Social Intelligence; *d*) a Bulletin Bibliographique hebdomadaire (published every Saturday).

It has also published a volume on " The Organization of Agricultural Statistical Services in the Several Countries ", and a volume on " Statistics of Cultivated Areas and of Vegetable and Animal Production in the Adhering Countries " (an Inventory drawn up from documents published by Governments), and " Monographs on Agricultural Cooperation in Various Countries (2. Vol) ".

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25	**British India .**	II	H. G. DERING, Delegate of Great Britain and Ireland.
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28	**Union of South Africa . . .**	IV	. . . .
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37	**Norway**.	IV	Dr. G. FJELSTAD, Agricultural proprietor.
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40	**Peru**	V	Dr. M. M. MESONES.
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42	**Portugal**	IV	LUIZ FILIPPE DE CASTRO, Professor of the Agronomic Institute at Lisbon.
43	**Roumania**. . . .	I	. . . .
44	**Russia**	I	His Excell. G. ZABIELLO, Counsellor of State, Consul General of Russia at Rome.
45	**Salvador**	V	A. BALLO, Acting Consul General of Salvador at Genoa.
46	**San Marino** . . .	V	His Excell. L. LUZZATTI, Minister of State of the Kingdom of Italy.
47	**Servia**	III	C. SCOTTI, Consul General of Servia at Rome.
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50	**Uruguay**	V	REQUEÑA BERMUDEZ, Chargé d'affaires of Uruguay to the Italian Government.

The information contained in some of the abstracts dealing with Canada has been most kindly placed at the disposal of the Institute by the Government of the Dominion.

The Canadian abstracting is by Mr. J. K. Doherty, the able chief of the Canadian Bureau of Correspondence with the International Institute of Agriculture.

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AGRICULTURAL INTELLIGENCE

NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of February and March 1912.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES DEALING WITH AGRICULTURE AND INDUSTRIES DEPENDENT ON IT.

Grants for Promoting the Cultivation of Olive Trees in France 599
(Note on the Establishment of Experiment and Demonstration Fields according to Art. 131 of the Financial Law of July 13, 1911 and the Decree of Sept. 20, on the Allotment of Grants for Promoting the cultivation of Olive Trees. — *Journal Officiel de la République Française*. No. 36, pp. 1082-1083. Paris, 26 Février 1912.

France

According to instructions issued by the Ministry, the agricultural associations or cooperative societies of olive growers, which benefit by the grants must cultivate for their own account the experiment and demonstration olive yards, and this holds good both whether these olive yards are their property or if they are only rented. An exception is made in the case of olive yards in which experiments against parasites will be carried out.

The amount of the subsidies granted may not exceed 75 % of the total estimated expenses.

The note states the conditions that the experiment and demonstration fields are to fulfil.

The experiments and demonstrations are divided into two classes:

1. Improvement of cultivation:

2. Control of parasites.

The olive yards belonging to the first class will be chiefly demonstration fields.

The others, at least for certain parasites, will have more the character of experiment fields, being devoted to testing the action of treatments, the efficacy of which has not yet, nor in all cases, been sufficiently demonstrated.

A control plot will always be necessary to allow of results being checked.

As regards the fields for the improvement of the methods of cultivation, experiments and demonstrations in the following subjects will be carried out, either simultaneously or separately:

a) Cultivation of the soil;
b) Manuring;
c) Pruning;
d) Irrigation.

The experiments and demonstrations to combat the parasites of the olive tree will include the following animal as well as vegetable pests: *Cycloconium oleaginum*, canker of the stem and branches, fumago, *Lecanium oleae*, *Dacus oleae*, *Prays oleellus*, *Thrips oleae*. But the above list is not exclusive.

The following particulars will have to be supplied by any association desirous of organizing one of the above fields:

Information on the olive yard: Generalities, nature and analysis of the soil, situation, and aspect; number of plants, and area, number of plants of each variety, age and state of the trees, average annual yield during the last few years; information on the cultivation and manuring of the soil, and on the pruning and other treatments to which the trees have been submitted.

Programme of the proposed work:

1. Cultivation of the soil.

Number of times the soil is to be ploughed in the course of the year, dates and depth of such work. Number of times the soil will be loosened superficially, dates at which such work is to be done, and implements used; hoeing round the trees.

2. Manuring: whether it is intended to manure every year, or every two or three years, with what manures, how and when to be used.

3. Pruning: what kind of pruning it is proposed to follow (vase, dome or table-shaped); every year or every two, three or more years; at what time of the year; supplementary pruning (suppression of superfluous shoots, of shoots from the foot of the stem etc.).

4. Irrigation: number of irrigations per year, quantities of water, time of the year for irrigating.

As for the control of one or more pests, it may either be the object of a distinct experiment in an olive yard especially chosen for the purpose, or it may be carried out in one of the cultural experiment fields.

The programme of the work that the associations intend to carry out, in order to avail themselves of the grants, must always be accompanied by a detailed estimate of the probable expenses.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

PEREZ, GEORGES V. **Agriculture in the Canaries.** (Notes agricoles et horticoles sur les Canaries).—*Journal de la Société Nationale d'Horticulture de France.* Tome XIII, pp. 42-46. Paris, Janvier 1912. **600**

For some years, the principal crop of the Canaries has been *Opuntia cochenillifera*, grown for rearing the cochineal insect, which is exported on a large scale for the manufacture of the crimson dye; 25 millions of lire (£1 000 000) worth being exported annually. Larger quantities of soda and potash than even of cochineal insects are exported. The former substances are obtained from "barrilla" the ash of *Mesembryanthemum crystallinum* and *M. nodiflorum.* The cacti, which are intensively cultivated for the cochineal, never lose their vegetation however much they are attacked by successive generations of these insects, which shows the enormous powers of resistance possessed by the plants. **Canaries**

In the south of Teneriffe, and on the island of Lanzarote, a method of dry-farming has been employed for years which permits of the cultivation of onions, maize and peas in a district where the annual rainfall does not exceed 250 mm. (10 in.).

The system consists in covering the ground with a layer 20 cm. (8 in.) deep of "*zahorra*" a volcanic sand or tufa, rich in potash and phosphates, and possessed of unusual hygroscopic properties, which preserves the moisture of the soil and hinders evaporation. The system originated in the Sahara.

In the Canaries the Chinese banana (*Musa Cavendishii*) is cultivated; it succeeds well everywhere because there is plenty of water and of good fertilizers. The centre of cultivation is Orotava, which lies beneath the table-land of Cañadas 2 000 metres (6500 ft.) high; the water from the table-land is tapped by tunnels, and is distributed for irrigation by aqueducts, so that there is a never-failing supply.

The flora of the Canaries contains many little-known plants. The shrub "tagasaste" (*Citisus proliferus*, var, *palmensis*) resists drought in a remarkable manner. It is a forage plant of the greatest importance throughout the whole of N. Africa. All the cattle of the Canaries are fed on this shrub. It is not allowed to grow large, as when cut down it shoots up twice or thrice a year. The trunk should never exceed 1 metre (3 ft. 3 in.) in height. Such a shrub has all the advantages of lucerne, also it is more nutritive and does not require irrigation. Further, its magnificent flowers offer great attractions to bees. Besides the "tagasaste" the following plants should be mentioned: "Gacia" (*Cytisus stenopetalus*), and *Genista splendens*, used for forage, and *Cytisus nubigenus*, *Ulex europaeus*, *Psoralea bituminosa* and *Lathyrus tingitanus*, which are of less value for fodder.

Noticeable among the flowers of the Canaries is *Statice*, which is very well adapted to the Mediterranean districts. Species of *Echium* also supply good forage and are drought-resistant.

In the Island of Lanzarote, sisal grows well; it was introduced there recently as an experiment. In the same place there is geyser water; this can be obtained by boring and is of the greatest use in the cultivation of bananas, which bring to the Canaries a yearly revenue of 2 500 lire per hectare (£40 per acre).

601 BUTLER F. G. **Agricultural Progress in Newfounland.** — *The Maritime Farmer*. St. John, N. B., Can., Vol. 17, No. 6, December 26 1911.

New-foundland. Canada

The Agricultural Society of St. John's Newfoundland, is busy importing and supplying to farmers seeds and machinery of the best quality obtainable in Canada, at greatly reduced prices; also lambs, calves, cows, swine and other animals of pedigree stock, free of Customs duty. Much agricultural literature including farm papers, experiment station and other government reports, is being distributed to farmers.

Already three shipments of sheep have been imported from Canada and shared out by the Board of Agriculture. In order to

enable farmers to carry on sheep raising in safety in St. John's East and West, it has been decided to have a vote taken in this electoral district with a view to prohibiting the keeping of dogs after May 1st, 1912.

In the distributing of live-stock a signed agreement is entered into between the President of the Agricultural Society and the Keeper of the Society's live-stock, wherein the former agrees to provide, and the latter to take and keep at his own risk and expense in good order for service at his farm, the animal or animals transferred, for a period of three years from the date of the agreement. The keeper also agrees to keep a record of the pedigree of the progeny of each animal placed at his disposal. At the termination of the three-year period, if all parts of the agreement have been lived up to, the animals involved become the property of the keeper.

SCHLOSSMACHER, I. **Development of Agriculture in Kamerun.** (1) (Wirtschaftliche Tatsachen und Möglichkeiten aus Kamerun). — *Deutsche Kolonialzeitung*, Nr. 6, pp. 84-86. Berlin, 10. Februar 1912. **602**

In the last nine years the agricultural exportation of Kamerun has gone steadily up, as seen by the following figures:

1902	£327 000
1909	£772 000
1910	£1 080 000

This shows a three-fold increase in the nine years. **Kamerun**

The principal articles of export are rubber, palm-nuts, palm-nut oil, and cocoa. The exportation of all these, however, is susceptible of considerable increase. At present the plantations of rubber and cocoa are hardly in bearing, and new districts are being opened up where rubber and palm-nuts can be grown.

For the development of the trade in palm-nuts and palm-nut oil, factories must be set up.

The future of rubber, palm-nut oil and cocoa in the world's commerce is indisputable, so that from this point of view Kamerun is favourably situated. The exportation of ivory, however, is steadi-

(1) See *B.* Jan. 1911, No. 14; July 1911, No. 2047; Jan. 1912. No. 20. (*Ed.*).

ly declining; but this might be made up for by growing tobacco, which has been shown to give excellent crops in Kamerun.

There is further great scope for the exploitation of timber, both common and choice.

Live-stock breeding should not be excluded. In the Upper Kamerun the Breeding Station supported by the Government and by a Mission has started experiments in conjunction with cultivators, and has obtained good results. But live-stock can only be of local value and will not serve for exportation.

For rubber development two laws are required: the first should protect rational exploitation from the destructiveness of the natives; the second should deal with the commercial classification of rubber, so as to improve its position on the world's market.

The chief zone of rubber plantations, belonging to Associations, is in the northern mountain and forest regions, but there are also some at Sanga and in the south.

The demand for land for cultivation is increasing. The government has decided to contract leases and sales only with a guarantee of cultivation, so as to prevent speculation which may end by leaving the land uncultivated.

The progress of Kamerun is bound up with the development of railways and other means of communication, as well as with the regulation of watercourses.

603 GIRIEND (French Consul at Zanzibar). **Agricultural Exports from Zanzibar in 1910.** (L'Exportation agricole de Zanzibar en 1910). — *Rapports Commerciaux des Agents diplomatiques et Consulaires de France:* No. 976; pp. 1-17. Paris, 1912.

Zanzibar

For some years there has been a sensible decrease in agricultural exports from Zanzibar. This is due to the fact that the commerce of the interior is being deviated to the English port of Mombasa and the German port of Daressalam. It is very regrettable that agricultural interests have not been developed in time to lessen the consequences of competition.

The present state of things is caused by the penetration of three important railway systems into regions hitherto neglected: 1) the Mombasa line to Lake Victoria; 2) the Tanga line to Kilimandjaro, and 3) the Daressalam line to Tabara.

In 1910 the total value of the exports from Zanzibar amounted to £1 054 136.13*s*. They consisted of three distinct groups. The first two included products imported from Europe, America, Asia, and Africa, and belonging to the old transit trade of Zanzibar, while

the third was composed of local products. These articles were cloves, coprah, and cord made of the fibres of the coconut.

Of these the exports in 1910 are valued at:

Cloves	£	258 539
Coprah	»	223 757
Coconut fibre ropes	»	3 458

The increase is due entirely to the coprah and the cord, as there was a considerable diminution in the amount of cloves exported. The local production of coprah is now considerable, this has been favoured by the high price coprah fetches on the world's market, (as much as £26 per ton has been paid for it).

The improvement will continue, and even advance, as many plantations are not yet productive.

The coconut palm is much mose profitable than the clove-tree. It bears sooner and more regularly; it requires less labour; it yields four times a year; its fibres can be made into ropes, its leaves into roofing for huts, and its woody rind into fuel.

RURAL HYGIENE.

SCHROEDER E. C, **The Relation of Bovine Tubercolosis to Public Health,** — *Appendix* II, *Eleventh Annual Report of the Canadian Association for the Prevention of Tuberculosis.* Ottawa, Canada, 1911, p. 107-124. 604

After reviewing briefly the progress that has been made in the study of tuberculosis, the author states two facts whith which the subject deals: 1) That the tubercle bacilli that attack mammals, including the human species, are of two distinct but closely related types, the human type and the bovine type; and 2) that human and bovine types are found in human tuberculosis. **Canada**

Of 438 tuberculous persons examined in the Research Laboratory of New York City, 32 or $7\,^{1}/_{3}$ per cent showed tubercle bacilli of the bovine type. Of those older than 16 years less than one-third of one per cent showed bovine tubercle bacilli; between the ages of 5 and 16 years $16\,^{2}/_{3}$ % showed bovine tubercle bacilli, and of children less than 5 years old $26\,^{1}/_{5}$ per cent showed the same bacilli.

Considering the source from which bovine bacilli are disseminated in a manner that leads to their introduction, alive and virulent into human hodies, the author points out that meats and meat products do not require special consideration because these are sterilized by cooking before being eaten. He expresses the view that through the agencies of milk, cream, butter etc. the tuberculous dairy cow, under existing conditions, may be charged with practically all the human tuberculosis that is not caused by tubercle bacilli expelled from bodies of human tuberculous individuals.

The author's general conclusions are briefly stated as follows:

1. It has been proven absolutely, that bovine tnberculosis is responsible, for a not yet well defined proportion of human tuberculosis, but a proportion that is now known to be entirely too large to be ignored.

2. It has been proven absolutely, that a large proportion of the tuberculosis that occurs among children is chargeable to the bovine source of infection.

3. It has been proven that tubercolous cows need not be visibly diseased to expel tubercle bacilli from their bodies in a dangerous way.

4. The satisfactory protection of public health against tuberculosis due to infection from the bovine source requires that we should either pasteurize or sterilize all milk or obtain it from cows proved by the tuberculin test to be free from tuberculosis.

5. Tuberculosis among cattle, apart from the direct infection of persons with bovine tubercle bacilli, is a condition we must fight early and late, until it has been fought to an end, otherwise we will neglect what the proper conservation of the human food supply urgently demands. This means the control and, eventually, the eradication of bovine tuberculosis and we can go a long distance and spend much thought and money, without even approximating the value of the magnificent returns the accomplished eradication of bovine tuberculosis will give, not alone to those who are interested in different branches of animal husbandry, but to the whole people.

605

The Control of Pellagra in Roumania and the Bukowina. (Combaterea pelagre). — *Càmpul,* an. XI. no. 1, pp. 23-25. Bucuresti, Januarie 1912.

Roumania. Austria. Hungary: Bukowina

In his last report on the control of pellagra in the Bukowina, the General Director of the Sanitary Service points out that up to 1912 only few pellagra patients were received in the hospitals,

and that recently their numbers have constantly increased. The great majority of these patients belongs to the poorest and most hard-working classes; the greater part of them do not own land, nor milk-producing animals.

In 1905 the Roumanian State Administration voted 15 750 fr. (£625) for the control of pellagra, and the Government of the Bukowina 5 250 fr. (£208. 6*s* 8*d*). The total sum was devoted to the construction of a hospice for pellagra patients from the districts of Cernauti, Radauti, and Luceava, in which 211 sick were treated for some months.

In 1906 the State gave 15 750 fr. (£625), the Government of the Bukowina also £625 and some religious corporations 10 500 fr. (£416. 13*s* 3*d*). These funds were partly employed in opening, in 12 communes situated in 5 districts, hospices in which, for a length of time, 471 pellagra patients were treated; the rest of the money, 1 050 fr. (£41. 13*s*. 4*d*.) was spent in the purchase of artificial manures which were sold at half price to the small landowners suffering from pellagra. Besides the above measures, the Minister of Agriculture devoted 15 750 fr. (£625) a year to the purchase of milk-producing stock, the milk of which was distributed to the pellagrous poor.

The results which attended the use of wholesome and improved nourishment were very satisfactory, provided that this better diet would be enjoyed, without interruption, for a period of one to two years. 291 women and 259 men were treated in these hospices. The women suffering from this disease are more numerous than the men, because the latter emigrate during the periods in which there is a demand for agricultural labour, and leave their women in the greatest poverty.

The great majority of patients received in the hospices are between 41 and 50 years old, then come those between 31 and 40; children suffer least from this disease and their number reaches only 2% of the patients admitted into the hospices.

An enquiry has shown that out of 1250 pellagrous patients 169 did not own the smallest plot of land, 359 had an insignificant area; 454 had not enough to keep their families upon it; 160 had a small but sufficient property. Only 47% owned some cows.

The report again furnishes evidence that the best prophylactic measure against pellagra consists in an improvement of economic conditions.

606 ROPER, CHARLES. **Some Effects of the Climate on the Health of Imported Tea-Garden Labour in Assam.** — *The Journal of Tropical Medicine and Hygiène*, Vol. XV, No. 4, pp. 49-57. London, February 15, 1912.

British India: Assam

The following is a summary of the more important conclusions arrived at by the writer from a consideration of the effect of climate and mode of life on imported tea-garden labour in the Lakhimpur and Darrang districts, Assam :

1. The first two years of residence are the most trying for coolies, and much more so for men than for women.

2. The proportional mortality from anaemia in women increases with length of residence ; in men it remains about the same.

Whereas male deaths from all causes under two years' residence: ditto over five years : : 180 : 118, and similar female figures show the proportion 160 : 138 ; considering anaemia cases only, males show 28 : 18, and females 43 : 43. As the best pluckers on a tea-garden are to be found amongst adult women of senior residence, in the writer's opinion it is the hard work toward the end of a season which particularly affects the women.

3. The death-rate from malaria amongst children under 5 years of age is about twice as heavy amongst boys as amongst girls. In adults it is two or three times as heavy amongst women as amongst men, this disproportion tending to increase with length of residence.

The total sex deaths being equal (48 male and 47 female) amongst infants and children up to 5 years of age, we get males: females : : 30 : 17; amongst adults we get females: males : : 25 : 11, and taking those of over four years' residence in Assam, females: males : : 15 : 5.

4. The mortality from bowel complaints is very disproportionately high in comparison with that of all causes of death in the first two years.

	Males		Females	
	Under 1 year's residence	Over 5 years' residence	Under 1 year's residence	Over 5 years' residence
Deaths from all causes . .	93	118	71	138
» » diarrhoea and dysentery	52	42	34	32

5. Amongst coolies over 45 years of age the mortality from bowel complaints becomes greater amongst women and less amongst men.

6. There is reason to think that acclimatization for dysentery occurs in some degree amongst imported tea-garden labour.

Under 1 year's residence total deaths : dysentery deaths : : 164 : 67 ; over 5 years' residence total deaths : dysentery deaths : : 256 : 35. On the other hand some figures given by Bryden tend to show that there is no acclimatization for dysentery amongst Europeans.

7. Length of residence tends to predispose coolies to death from pneumonia.

	Under 1 year's residence	Over 5 years' residence
Deaths from all causes	164	256
» » pneumonia . . .	8	43

8. The proportion of deaths amongst acclimatized coolies from pneumonia to those from all causes, while markedly increasing in males, does so in a far greater degree in women.

	Males		Female	
	Under 2 years' residence	Over 5 years' residence	Under 2 years' residence	Over 5 years' residence
Deaths from all causes . .	180	118	160	138
» » pneumonia . .	28	28	12	15

BEST, W. **Anti-Malarial and Anti-Yellow-Fever Work in Calabar, Southern Nigeria.** — *The Journal of Tropical Medicine and Hygiene*, Vol. XV, No. 4, p. 60. London, February 15, 1912. **607**

S. Nigeria: Calabar Gold Coast. Sierra Leone

A most energetic and continuous campaign has been recently carried on in Southern Nigeria against the carrier of malaria. The clearing of bush and rank vegetation, reclamation of swamps, destruction of mosquito breeding places, the use of kerosene oil for collections of water which cannot be otherwise treated, the filling-in of surface depressions, the use of anti-mosquito wire-gauze for rooms and houses, and the use of quinine as a prophylactic were the chief measures undertaken.

The quantity of quinine issued during 1911, for prophylactic use alone, was as follows: — 275 671 gr. to natives (gratuitously); 125 000 gr. to European officials ; 52 090 gr. to European non-officials. In addition, arrangements have been made for the issue of this drug gratuitously to all children (50 per cent. of whom harbour the malarial parasite) attending Government Schools.

Information was received in the month of May that yellow-fever had appeared on the Gold Coast and Sierra Leone, in an epidemic form. In order to prevent its introduction into Southern Nigeria, energetic measures were adopted, especially in the chief littoral stations. Quarantine restrictions, the erection of a quarantine station hospital, visitations and inspections, etc. were carried out as precautionary work. In addition, destruction of mosquitoes and the abolition of their breeding places, clearing of all bush and rank vegetation were rigorously carried out, special attention being paid to receptacles capable of forming a potential breeding ground for the *Stegomyia* mosquito, the carrier of this disease.

The result of the work done was most beneficial, the general sanitary condition being greatly improved.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY.

608 ZAGO, F. **The Institute of Agriculture and Domestic Economy in Florence.** (L'Istituto Agrario femminile e di Economia Domestica di Firenze). — *Giornale di Agr. della Domenica.* Piacenza, 7-14 Gennaio 1912.

Italy

The aim of the above Institute is to instruct young women in the elements of agriculture and of domestic economy and to teach them to keep house well and look after their families. The school was founded in 1908 on the initiative of a Committee of ladies. The teaching is entrusted to a staff of professors who are specialists in the following subjects: gardening, bee-keeping, poultry-rearing, cheese-making, preserve-making, fruit-growing and horticulture, domestic economy and general hygiene, dress-making and cooking, infantile hygiene.

The horticultural, fruit-growing and gardening work is carried out in the garden, kitchen-garden and orchard belonging to the school, and also on the large farm, in the green-houses and gardens of the Royal School of Fruit-growing.

The school admits girls who have completed their fourteenth year, and can show certificates of work from public or private schools equivalent to the leaving certificate granted by the technical school or gymnasium.

In 1911, the number of students on the list was 40; they belonged to various classes, about one third were elementary teachers, one third belonged to the middle class and the remaining third to the aristocracy.

It is the intention of the Committee of the school to entrust to such students, as have shown special aptitude, the instruction of classes for rural labourers, with the aim of extending the influence of the Institute in the country, and also to have travelling courses of instruction for the wives of farmers and peasants in the country, and for artisans in the town. Amongst other schools of domestic economy in Italy, may be mentioned those of Niguarda established in 1902, of Turin in 1907, and of Bergamo in 1908.

FERNANDEZ DE LA ROSA, G. **Agricultural Instruction in Spain** (La enseñanza agricola en España). — *Boletín de Agricultura Técnica y Económica*, N. 37, pp. 45-55. Madrid, 31 Enero 1912. **609**

After touching on the special characteristics of agricultural science, and briefly describing the stage which had been reached during the three great historic epochs, the writer passes to consider the impulse given in the 19th century to the means of instruction. **Spain**

In 1813 Chairs of Agriculture were created by royal decree in all the capitals of provinces. But this ordinance, like those of 1819 and 1821, was never put in force. It was not until 1890 that the decree of 1849 for the foundation of three practical schools of agriculture — one in the centre, another in the North, and the third in the South of the peninsula — found practical application.

Then the Schools of Tudela in Navarre, and of Oñate in Guipúzcoa were established. In 1855 the Central School of Agriculture was founded, now the Special School of Agricultural Engineers, established in 1869, in the domain La Florida, which at that period formed part of the crown property. To the well-appointed laboratories, scientific collections and museums which it already possessed, this School has recently added a Station for plant pathology, an agronomic station, an experimental farm for New Castille, and lastly a machine experiment station instituted by de Arce. All these establishments are not interdependent, but the needs of the different services necessarily brings them into close connection. The writer shows the necessity of constructing the projected new edifice for the Special School of Agricultural Engineers. He proposes to deal in another article with the internal organisation of the School, and of the institutes to which it has given rise, and concludes with

a brief survey of the legislative provisions which have contributed to raise the status of the agricultural career. He specially mentions the royal decree of 14 February 1879, with called into existence the corporate body of Agricultural Engineers, and subsequent laws providing for experimental farms and Schools, oenologic stations, experiment fields and the like.

610 **International Students' Judging Competition.** — *Farmers' Advocate*, London, Canada, December 14, 1911, p. 2065, and *Canadian Farm*, Toronto, Canada, December 22, 1911, p. 7.

There was held at the International Live Stock Show at Chicago in December, 1911 the annual competition in judging live stock between students of Agricultural Colleges in North America. Ten colleges competed, each having a team of five men. The animals judged consisted of Belgian and Percheron stallions and Belgian geldings, Shorthorn heifers, Angus steers and Hereford bulls; Hampshire rams, Southdown wethers and Lincoln wethers; Duroc-Jersey barrows, Berkshire sows and Poland-China boars.

Canada. United States

Fifty points were allowed for correct placing and fifty points for perfect reasons.

Of the ten colleges which competed, three are Canadian institutions and these won the 1st, 2nd and 4th general awards. Of the ten individual students scoring highest points seven belong to Canadian colleges. Five thousand was the maximum number of points possible. The complete standing of the colleges with the score made by each is as follows:

Macdonald, Quebec, Canada, 4363 ½; Manitoba, Canada, 4335 ½; Missouri, U. S. A. 4315; Ontario, Canada, 4205; Iowa, U. S. A. 4154 ½; Texas, U. S. A. 4121; Montana, U. S. A. 4120; Ohio, U. S. A. 4108 ½; Kansas, U. S. A. 4069 ½; Nebraska, U. S. A. 4032 ½.

611 RICE Prof. JAMES E. **The New Poultry Building at Cornell University, U. S. A.** — *The Illustrated Poultry Record*, Vol. 4, No. 5, pp. 207-209. London, February, 1912.

The Poultry Husbandry Building, now in process of construction at Cornell, is the result of a special appropriation of $ 90 000 made by the New York State Legislature of 1909-10. It contains a basement, three stories and an attic. On the basement and first floor are the killing room, the egg handling and testing room, the laundry, storage room and other offices. The second floor contains

United States

a general office, and five private offices, a general research laboratory, a library, an exhibition room, a seminary room, and a small recitation room. The third floor includes a large lecture room, two large laboratories, a photographic room and a recreation room. The latter will also serve as a meeting place for the Poultry Association and the Winter Poultry Course Club. It is planned eventually that there will be loggias extending from each end of the main building, and leading to a judging pavilion to the west, and an incubator building and brooder houses to the east. The chickens will be reared, the breed testing project will be carried on, and the regular investigational work will be conducted on the fifty-acre poultry farm North of Forest Home, about three-quarters of a mile from the teaching plant.

The main building, the extension and the auxiliary buildings, when completed as planned, will provide accommodation for teaching at one time one hundred or more winter course students and nearly three hundred regular and special students in the elementary lecture, laboratory, and practice courses.

ZIMMERMANN, A. **The Imperial Biological Agricultural Institute at Amani, German E. Africa.** (Das Kaiserlich Biologisch-Landwirtschaftliche Institut Amani). — *Ill. Landw. Zeitung.* Berlin, 10. Februar 1912. **612**

The Biological Agricultural Institute of Amani was founded in 1902 by Count v. Götzen, then governor of German E. Africa. Its objects are the following:

German East Africa

1. Research, from a practical point of view, of the necessary conditions for the growth and development of cultivated tropical plants.

2. Researches on the diseases and insect and other pests of cultivated plants, and on the means of prevention and cure.

3. Soil analyses; experiments on manuring; analyses of raw materials and of animal and vegetable products, which present any interest either as matter for exportation or as human food or medicinal substances.

4. Study of the flora and fauna of German E. Africa.

On account of its favourable conditions of soil and climate, Amani, in the mountains of Eastern Usambasa was chosen as the site of the Institute. The land belonging to it is 741 acres in extent and rises from an altitude of 1300 feet, on the banks of the river Sigi, to 3575 feet at the top of Mt. Bomole.

Thus at Amani, exclusively tropical plants, such as cocoanuts, black pepper, *Hevea brasiliensis* etc. may be grown together with subtropical ones, such as chinchona and camphor trees, conifers, etc.

The station of Mombo at the foot of West-Usambasa completes the experiment station of Amani by affording a great extent of land in the plain.

The principal buildings and the laboratories of the station are situated at nearly 3000 ft. above sea-level.

An area of about 250 acres has already been cleared of forest, preparatory to being cultivated, and about thirty miles of roads have already been built in the estate. The following figures will give some idea of the importance of the available material of the station:

During the year 1910-1911, 402 consignments were made, of which 359 to private persons and 43 to State institutions; they comprised 8169 plants, 45 packages grasses, 1002 cuttings and 7000 bulbs, besides 2927 parcels of seeds grown for the most part on the land of the station. It is expected that in the current year the number of plants and seeds to be distrituted will be much greater.

The Institute has devoted a good deal of its activity to the study of improved methods of growing and preparing tropical produce. Thus, for rubber, by adopting a new method of coagulation it has been possible to diminish considerably the cost of production; in the preparation of camphor and the gathering of chinchona bark the new methods introduced have been attended by excellent results. The bark obtained bears comparison with the Java bark in every respect.

The production of essential oils, of tanning matter and of dyestuffs has also received much attention.

Important experiments have been carried out in the cultivation of various kinds of maize, the best of which have already been distributed to European and native growers. Henceforward a greater development will be given to the cultivation of rice and, generally, to irrigated crops.

The laboratory of plant pathology has been very busy and every effort is being made to spread information as to the best means of controlling the diseases of plants, and insect pests. Manuring experiments are carried on, not only at the Amani station but also in private properties. The chemical laboratory has analysed a great number of soils and the employés of the station, at every request, visit private properties with the object of supplying practical information and advising as to the methods of cultivation which, in the experiments carried out, have been attended by success.

During the winter the course of tropical agriculture was attended by 24 farmers and 4 employés of the Station.

Consultations by letter have also increased very much. The station has answered 333 questions put by farmers asking for information on various subjects counected with agriculture, and beyond the limits of the Colony 72 items of information were forwarded to private enquirers and 151 to institutions.

At present the propaganda of the station is carried on by *Der Pflanzer*, a newspaper that is published at Dar-es-salam. More important publications are the "*Berichte über Land- und Forstwirtschaft für Deutsch Ost-Afrika*".

Lastly, it may be mentioned that among the annexes of the Amani station there is a building for the accomodation of visitors; these are for the most part Europeans that have settled in the colony, students, and farmers and employés of the neighbouring English and Italian colonies.

WATTS, FRANCIS. **Experimental Work at the Botanic Station and Experiment Plots, Montserrat, during 1910-1911.** — *Imperial Dep. of Agr. for the West Indies. Report for 1910-1911*, pp. 1-22. Barbados, 1911. **618**

The details of this Report as to the distribution of planting material from the stations show the existence of a diversified demand for plants in the island.

British W. Indies: Montserrat

Over 18 000 plants have been distributed, 12 250 of which were of lime trees, and over 18 000 cuttings of sugar cane and sweet potato.

With a view to obtaining a race of cotton plants suited to local conditions and producing lint of good quality combined with high yield, the various types selected in the preceeding year were given comparative trials in the Experiment Station and the crop submitted to spinning trials.

The best results were obtained with the following varieties: Dagenham No. 4, Heaton No. 8 and 9, and St. Vincent No. 1. Practically all the cotton estates will have trial plots in 1912 planted with the best strains from the station, some 500 lb. of seed having been distributed.

Twenty-seven plots were devoted to cotton manurial experiments, including nitrogen, potash, phosphate and cotton-seed-meal series.

Efforts have been made during the last two years to collect all the varieties of sweet potato cultivated by the peasantry, with a

view to their introduction into the trials with this crop in the experiment stations.

The results of the experiments so far show that some of the local kinds are heavy croppers, and are likely to prove useful additions to the collection.

A description has been made of all the varieties cultivated in the Station.

The characters considered were: colour of stem, colour of petioles, colour of venation, character of growth, colour of potato and colour of flesh (raw). These botanical characters are so far sufficient to identify correctly any variety of sweet potato.

The Ground Nuts trials are regarded as the most reliable trials yet conducted in Montserrat. The Carolina Running variety has given a yield of 1 706 lb. of cured nuts per acre. The method of determining the yield of cured nuts was to weigh the nuts as reaped and to deduct 35 % for loss on drying. Gambia, Spanish and Local have also proved to be very good varieties.

The experiments in the breeding of Indian corn were continued, and thirty progeny rows were grown in the Station. Each row was reaped and weighed separately and the best cobs from the heaviest cropping rows were kept for replanting. The actual yield was 36 bushels of shelled corn per acre.

A collection of seventeen sugar-cane varieties is maintained in the Station. An important section of the Station is devoted to recently introduced plants, the most important of which are Indian Fodder Grass (*Pennisetum cenchroides*), a Californian Grass (*Paspalum dilatatum*), Soy bean (*Glycine hispida*), Urd or Jerusalem pea (*Phaseolus trinervis*), Boia Medelloa (*Tephrosia candida* and *T. purpurea*), Bambarra Ground-nut (*Voandzeia subterranea*) and Yequie Manicoba Rubber (*Manihot dichotoma*).

AGRICULTURAL INSTITUTIONS.

614 **The Agricultural Improvement Association of North Dakota.** — *Farmer and Breeder.* Sioux City, Iowa, January 1912.

United States: North Dakota

This new association consists of North Dakota bankers, business men, and land owners, and has raised a fund of \$300 000 to be expended during the next three years at the rate of \$100 000 a year for the purpose of promoting agriculture in the State.

Plans are being perfected for conducting demonstration farms in various parts of the State, in localities representing the principal soil types, to be located so as to be of easy access to visitors from the surrounding territory. On some farms methods for the conservation of soil fertility will be studied; on others more and better live stock will be introduced with a view of demonstrating that the farmers all over the State would be greatly benefited if they would give more attention to diversified farming than they now do.

In certain sections such crops as clover, alfalfa, and peas will be grown. Much attention will also be paid to the production of corn and better varieties of oats, wheat, barley, and other small grain crops.

The farmers who are to co-operate with the association in this educational demonstration work are to carry on the work themselves, but the management of the land devoted to demonstration work, is to be under the direction of an expert furnished by the Agricultural Improvement Association.

This association is a private concern and donates this $300 000 fund for the good of the cause. This is the first large movement of its kind financed by private capital in the United States. Director Thos. P. Cooper, formerly of the Minnesota Experiment Station, will have charge of the work.

AGRICULTURAL SHOWS AND CONGRESSES.

New Zealand Shows. *The Pastoralists' Review*, Vol. XXI, No. 11, pp. 1209-1212. Melbourne, January 15, 1912. **615**

The annual spring show of the Otago Agricultural and Pastoral Society opened in Dunedin on 29th November.

Of horses only Clydesdales were on view.

In the cattle section the total number of entries was 176, among them a number (61) of high class Ayrshires. The exhibit of Shorthorns was in all respects highly satisfactory. **New Zealand**

Competition was exceedingly keen and the judge had much difficulty in arriving at his decisions. In the Polled Angus section the noted Gladbrook stock at once assured the quality of the cattle exhibited. The Jersey cattle exhibit was only moderately good. The Holstein cattle entries were not numerous, and the

competition not very close. The fat cattle section presented some fine-conditioned animals.

The show of sheep was splendid. The strongest sections were the Border Leicester and the Romneys. There were also some Shropshire Downs and in-bred half-breds.

There was a very fine display of pigs.

The Southland Agricultural and Pastoral Association's Show was held on 12th and 13th Dec. 1911. In the sheep and cattle sections the entries were large and the quality of the exhibits excellent.

In the latter section there were representatives of nearly all the breeds, Shorthorns and Ayrshires being particularly strong.

As a whole the sheep section was very good. The Border Leicester and Romney Marsh breeds were well represented and there was keen competition in almost every class.

616 FORGEOT, E. **Fattened Poultry: Competition Show at Bourg.** (Le Concours de Volailles grasses de Bourg). — *La Vie à la Campagne*, Vol. XI, No. 129, p. 84. Paris, 1 Février 1912.

France

For nearly fifty years, at the approach of Christmas in each year, a competition show of fattened poultry has been held at Bourg, in the Department of Ain.

Owing to the prizes offered by the State, the town of Bourg, the Agricultural Assembly, and the Departmental Society of Agriculture, the amount of poultry exhibited increases year by year. In 1911 there were 430 capons, 702 pullets, 280 geese, 215 ducks and 174 turkeys. The breeders of Bény, Treffort, Saint-Étienne-du-Bois and Meillonnas are well known for the excellence of their methods (especially as applied to the breed *Bressane à pattes bleues*) and always carry off the first prizes.

The birds are from 6 to 8 months old when they are exhibited. The fattening lasts from the beginning of November to the 15th or 20th December. The average weight is then from 6.6 lbs to 8.8 lbs for capons, and 5.5 lbs to 6.6 lbs for the hens.

The birds are crammed by hand, and the farmer's wife judges of the amount of food to be administered by the state of the crop. They are fed thrice a day, (morning, midday, and evening) on balls of paste made of the meal of maize and wheat mixed with milk. No drink is given, except sometimes a little milk. The cages containing the poultry to be fattened are covered as soon as they have been fed. The birds are carefully watched, as they may often get ill and die of indigestion or plethora.

The export from the above-named districts to London, Paris, and Brussels is constantly increasing, and reaches the annual figure of 1 300 tons.

International Prize-Competition for Rice-Desiccators, at Vercelli, Italy, in May 1912. (Concorso internazionale di essiccatoi da riso, a Vercelli, Italia, nel Maggio 1912). — *Il Giornale di Risicoltura*, Anno II, No. 3, pp. 44-48. Vercelli, 15 Febbraio 1912. 617

Italy

At the time of the International Exhibition of Rice-Growing and Irrigation, to be held at Vercelli (1), there will be an international prize-competition for rice-desiccators.

The machines entered must be of one of the following classes:

1. Fixed machines, with minimum output of 20 tons of dried rice in 24 hours.
2. Fixed machines, minimum 10 tons.
3. Moveable machines, minimum 4 tons.

In all the classes, the desiccator must be capable of removing 20 % of water from the fresh rice.

Further information and programmes may be obtained from the "Associazione fra gli agricoltori del Vercellese", Via S. Anna, 15, Vercelli (prov. Novara, Italy).

Agricultural Traction Engines in Algeria. (Essais de Motoculture en Algérie). — *Office du Gouvernement Général de l'Algérie*, XVIII Année, No. 4, p. 61. Paris, 15 Février 1912. 618

Algeria

The Department of Agriculture is organising for 1912, from May 27 to June 15, in the districts of Sétif and Mitidja some test experiments in mechanical traction as applied to agriculture. They will, if possible, be continued in 1913 in Oran. They will be open to all constructors without distinction, and there will be no classification according to merit.

The Government General of Algeria, within the limits of the funds at its disposal, and following the order of priority of application, undertakes the transport to Algeria and back of machines intended for the experiments, from a French port to the station nearest to the place where the experiments will take place.

Applications will be received till 30 April 1912, by M. Stotz, Director of the Agricultural School of Maison-Carrée (Algiers), Commissioner General, who will reply to all requests for information.

(1) See *B*. March 1912. No. 471. (*Ed.*).

CROPS AND CULTIVATION

AGRICULTURAL METEOROLOGY.

619 NERUCEV, M. **On the Estimation of Humidity in Agricultural Meteorology.** (Usloviia Organisazii Selsko-Khosiaistvennekh Meteorologhiceskikh Nabliudenii). — *Khosiaistvo,* VII oi G. Isdaniia No. 4, pp. 89-95. Kiev, 26 Ianvaria 1912.

Russia

To determine whether there is a direct relationship between the quantitative value of the harvest and the total rainfall as registered by the raingauge, observations were made on fields of wheat sown in March at Elisavetgrad under the care of Presikov, and they lasted over a period of eleven years. The results are given in the following table; the spring rains, owing to their importance, are also given in percentage of the total rainfall.

Year —	Rain inches	Spring rain inches	Spring rain in percentage of total rainfall	Yield in cwts. per acre
1879. . .	26.5	8.6	32.3	3.15
1886. . .	19.4	2.4	12.4	3.63
1887. . .	16.3	4.3	26.2	7.47
1889. . .	18.5	7.6	40.8	2.46
1891. . .	21.4	4.7	22.0	4.43
1895. . .	17.3	2.7	15.3	6.09
1898. . .	13.1	3.3	24.3	6.69
1902. . .	14.4	4.2	29.0	3.82
1903. . .	14.5	2.5	17.8	7.88
1904. . .	9.2	3.5	38.2	4.66
1909. . .	14.9	3.3	21.9	8.38
Average .	16.9	4.3	25.3	5.34

In these eleven years there are five with harvests above the average, namely 1909, 1903, 1887, 1898, and 1895; in these the rainfall averaged 14,9 in., of which 3.2 (21.5 %) fell in spring; the crop averaged 7.3 cwt. There were six years with harvests below the average, namely, 1904, 1891, 1902, 1886, 1879 and 1889; in these the rainfall averaged 18.3 in., of which 4.2 (28.3 %) fell in spring; the crop averaged 3.7 cwt.

It will be seen that the rainfall and its distribution provide the most favourable conditions for the wheat precisely in those years when the harvest was scanty.

This shows that it is as a rule impossible to draw absolute conclusions based on the value of a single factor.

Here is an item which, although registered in meteorological tables, is almost always neglected both as regards itself and as regards its relation to the other items. This is the evaporating power of the soil and of plants, which is often two or three times as great as the atmospheric precipitation. Thus for the Experiment Station of Plotiansk we find a total rainfall of 16.3 in., with an evaporating power of 32.5 in., and for the Agricultural School of Lukianov, 13.75 in., and 37.3 in. respectively.

It is clear therefore how this factor must be regarded in calculating the balance of moisture in the soil available for plants.

Zebediev has been led by his investigations to the opinion that the aqueous vapours which condense on the ground are of much importance, as they increase the reserve of sub-soil water.

Consequently in studying the action of moisture on plant life, it is necessary to examine the conditions, which by accelerating or retarding the processes of condensation, determine the circulation of aqueous vapour from the soil to the surrounding atmosphere, and again from the latter to the soil.

HUDIG, J. **The Amounts of Nitrogen as Ammonia and Nitric (and Nitrous) Acid in the Rain-water collected at Uithuizermeeden. Groningen.** — *The Journal of Agricultural Science*: Vol. IV, Part 3 pp. 260-269. Cambridge. January 1911. **620**

The nitrates were determined according to the following method worked out by miss Huizinga. The results of the analyses of the rain-water collected with the pluviometer during 1909, are given in the following table, (the article contains also another table showing the results of analyses for the period July 1908 to December 1910): **Netherlands. Great Britain**

1909	Rainfall		Nitrogen per million		Rainfall × nitrogen p. p. m.	
	mm.	inches	as ammonia	as nitrates and nitrites	as ammonia	as nitrates and nitrites
January-April .	164	6.44	0.840	0.239	137.8	39.2
May-June . . .	88	3.45	0.980	0.281	86.2	24.7
July	97	3.81	0.607	0.214	58.9	20.6
August	123	4.83	0.327	0.167	40.2	20.5
September . .	94	3.69	0.187	0.167	17.6	15.7
October	67	2.63	0.840	0.254	56.3	17.0
November . .	82	3.26	0.653	0.154	53.5	12.6
December . . .	109	4.28	0.280	0.248	30.5	27.0

In general it may be said that the concentration of nitrogen is to a certain extent inversely proportional to the rainfall. It will be seen that in May, June, July, and August 1909 the decrease of ammonia and the incaease in the rainfall are rectilineal. In this case the nitrogen concentration seems to be directly proportional to the amount of rain-water. When calculating the amount of ammonia precipitated by rain per month expressed by the product of parts per million nitrogen and rainfall in mm., it is seen from above table that these products are still variable. This proves that the amount of atmospheric nitrogen bronght down by rainfall is not *only* dependent on the amount of rain, but is influenced by other meteorological conditions.

In representing graphically the amount of rainfall and the amounts of nitrogen as ammonia and as nitrates (and nitrites) precipitated during the different months, an inverse relative proportion is shown by the first two curves (rainfall and NH_3-N) while the third (NO_2N) is fairly horizontal.

A graph of the average monthly amounts of nitrogen as ammonia in Rothamsted rain from 1888-9 to 1900-1 shows a similar inverse relative proportion, but in a less degree. Miller (*The Journal of Agricultural Science*, Vol. I. 283, Table II) shows from the Rothamsted data that the concentration with low rainfall is always higher than with high rainfall. With a mean raiufall of 0,65 in., the rain-water contained 0.965 nitrogen as ammonia and 0.442 nitrogen as nitrates, whilst with a mean rainfall of 4.92 in., the

amounts were 0.278 and 0.124 respectively. These data correspond well with Mr. Hudig's experience. There is however no such relation between the total amounts of nitrogen and rainfall.

The relative proportion between nitrogen as ammonia and nitrogen as nitrates (and nitrites) calculated as an average is

0,724 p. p. m. to 0,237 p. p. m. or.
75·3 % to 24·7 %.

This proportion corresponds well with the Rothamsted and other data. The rain-water collected with the pluviometer represents a monthly average of individual samples of fluctuating composition. To obtain a better kuowledge of the latter, the writer sampled rain-water by means of a funnel of 1 m. diameter, placed in a bottle holding 20 litres. A sufficient sample was thus collected from a single shower. The composition of the rain was very variable. In some cases there seems to be a relation bclween the composition and the meteorological conditions under which the rain-water was sampled. For instance, the ammonia percentages were high, with some exceptions, when the samples were collected during thunderstorms; but under normal conditions they were not high. In samples taken on successive days the concentrations did not usually differ much.

The relative proportion between ammonia and nitrates calculated as an average was:

0.565 mgr. : 0.182 mgr.
75·6 % : 24·4 %.

It is noteworthy that this relative proportion corresponds quite exactly with that found by the gauge-observations, thongh they differ in absolute value.

	Nitrogen as ammonia	Nitrogen as nitrates and nitrites
Sample from rain-gange as a mean . . .	0.724 mgr.	0.237 mgr.
» » funnel » » . . .	0.565 »	0.182 »

The mean rainfall in the Netherlands (since 1852) is about 700 mm. (27.51 in.). Assuming the average composition of the rain-water to be the same as has been calculated from the gauge-observations — ·724 mgr. of N as ammonia and ·237 mgr. N as nitrates per litre or 0.961 total nitrogen — the soil only receives 6.73 kg. (14.80 lbs.) of nitrogen per hectare (2.4711 acres) per annum.

It has been shown by Liebscher, (*Verslagen van landbouwkundje onder-zoekingen der Rijkslandbouwproef-stations,* No. X. 911) and other investigators, that for cereals there is only one period which is significant for the assimilation of nitrogen. This period may be roughly marked out from about some weeks after the germination to the earing-stage; it lasts for almost 50 days. Thus it will be evident that from a manuring point of view the atmospheric combined nitrogen is of little importance.

621 HOFMANN, K., and HANSEN, J. **Meteorological Observations at the Experiment Station of Dikopshof, Bonn-Poppelsdorf.** (Die Witterung). *Zweiter Bericht vom Dikopshof, Erster Abschnitt,* pp. 1-6. Berlin, 1911.

Germany

The first chapter of the second report of the Experimental Station, Dikopshof, attached to the Royal Agricultural Academy of Bonn-Poppelsdorf deals with the meteorological observations made there in 1908 and 1909.

The course of the weather in these two years was very different, and was reflected in the sharp contrasts presented by the crops as regards their quantity and quality.

In 1908 the spring was cold and wet, with abundant, but unequally distributed, rain, in March and April. February had been relatively mild, with normal rainfall. May, June and July showed a relatively high temperature. The heavy rains and low temperature which began in August lasted till the first third of September, after which fine autumn weather set in and lasted till the end of October, during which period only 2.2 mm. (0.09 in.) of rain fell.

The cereals gave as a whole an unsatisfactory yield.

In 1909 the winter was unusually severe for Rhine districts, the mean temperature for January being —1.3° C. (29.6° F.), and for February —1.5° C. (29.3 F.).

The spring was late and the summer very wet, the only months relatively dry being May and June. The consequence was that the forage and beet crops suffered, while the grain harvest was unusually good.

MERCANTON, P. L. and VAN UFFORD, QUARLES. **Electric Niagaras** (1). (A propos des Niagaras électriques). — *Procès-Verbaux des Séances de la Société vaudoise des Sciences naturelles* No. 4, Séance du 7 Février 1912. Lausanne. 622

The electric Niagaras of Messrs. de Négrier and Beauchamp are nothing else but great lightning conductors, and are supposed to be able, like the hail preventers of 1825, from which they are derived, to discharge the electricity with which storm-clouds are laden. **Switzerland** Messrs. Négrier and Beauchamp while laying down as a principle that the formation of hail is due to the accumulation of electricity in the clouds, consider that the five "Niagaras" of the Vienne district, each 40 metres (150 feet) high and erected at a distance of 10 km. (about 6 miles) from each other will afford efficient protection.

M. Mercanton, among others does not place much faith in the efficiency of "Niagaras" and is of opinion that the results hitherto published should only be accepted with a prudent reserve. He is confirmed in this attitude by the history of the various attempts at protection against hail, and thinks that the hopes founded on the use of "Niagaras" are too slender and the apparatus too expensive to warrant the Canton of Vaud in adopting this method of hail control which has not even the merit of originality.

In this connexion, M. Quarles van Ufford recalls the but little known experiments of Prokop Divisch, curate of a small village in Bohemia who devoted his leisure time to the study of natural science especially of electricity. In 1754 he erected a lightning conductor consisting of an iron rod, one extremity of which communicated with the underground water and the other bore some horizontal arms supporting iron boxes studded with iron spikes and filled with iron filings. The whole apparatus was about 40 metres, (150 feet) high.

Several times Divisch was able to test the usefulness of his lightning conductor. He observed that the storms dissolved on approaching it, and that hail, frequent in the neighbourhood, spared the locality in which the apparatus stood. In spite of this benefit, Divisch met with no success; all the unfavourable meteorological phenomena which happened, such as the absence of snow, very cold winters, etc. were attributed to his apparatus, and at last the neighbours, believing that Divisch sent them the hail which otherwise would have fallen on his land, destroyed his apparatus which was never recon-

(1) See *B.* Nov.-Dec. 1911, No. 3107.

structed. Divisch's idea, however, has either been taken up again or it has independently occurred to other workers in the same field, and, in a somewhat modified and improved shape it underlies the present French " electric Niagaras ".

AGRICULTURAL GEOLOGY.

623 KOSSOWITSCH, P. **The Black Soils.** (Die Schwarzerde). — *Internationale Mitteilungen für Bodenkunde*; Band I, Heft 3-4, pp. 199-355. Berlin, 1912.

Russia

The black soils, from their extent and fertility, their stratigraphical importance, and richness in humus, have for a long time attracted the attention of pedologists, agriculturists and botanists. The "tschernosióm" occupies nearly all South European Russia and part of West Siberia, passing over in the north to grey forest soil and in the south to chestnut-coloured soil (Kastanienboden).

The climate in the district occupied by the black soils is continental and is characterised by: insufficient rainfall, dryness of the air, hot summers (mean 17 to 20° C.) and severe winters (mean —4 to —12° C.).

Two factors contribute to the aridity of this soil:

a) The rain comes down in the form of heavy showers, and the water has no time to penetrate into the ground, but runs off at once into the depressions and rivers.

b) The chief atmospheric precipitation is in the summer, when the water is at once taken up and used by the vegetation. The dryness of the soil renders the process of leaching very feeble, thus excluding the growth of trees, and causing the flora to present the characteristics of steppe vegetation, with a predominance of Gramineae, which are capable of resisting the saline nature of the soil.

The black soils are formed under the most varied lithological conditions. In the central portion of European Russia, the subjacent rock is Russian loess, which is fine in texture and rich in calcium carbonate. Further north, the subsoil consists of moraine clay; in the south, the black soils rest upon red-brown clay; in the south-east, on variegated saline clays and upon the sandy strata of the Aralo-Caspian sea. In the Transcaucasus, the " tschernosiom " is formed from the weathering of crystalline rocks, *e. g.* olivine-basalts.

Although the rocks to which the "tschernosiom" owes its origin differ so much in origin and in composition, yet they have certain common characteristics; porosity, richness in calcium carbonate, a tendency to perpendicular cleavage, the occurrence at certain depths of accumulations of gypsum and soluble salts (sodium chloride, sodium sulphate, etc.). These facts all tend to prove that the uniformity of the subsoil is the result of the process of the formation of the tschernosiom. Thus, in the northern part, where the subsoil consists of moraine clay, this is superficially somewhat changed, assuming the appearance of loess.

The Process of Tschernosiom Soil formation. — The composition of the soil and the subsoil does not substantially differ. The soil is richer in humus, nitrogen and phosphoric acid and poorer in lime, magnesium, and carbonic acid. The mechanical composition of both is similar.

The processes of leaching, which are relatively feeble, extend to considerable depth (more than two metres, 6 ft. 6 in.) with the accumulation of easily soluble salts, such as chloride and sulphate of sodium, these salts being wanting on the highest strata. Carbonates of magnesium and of calcium are deposited at a depth of 1—2 metres below the humus stratum, a little above the gypsum horizon. No removal of the finest particles of clay alumina or iron-oxide from the upper strata is observed, because in the formation of the tschernosiom, conditions were not favourable to the transport of substances in a colloidal condition.

The formation of the black soils was accompanied by a large accumulation (up to 16 %) of humus. The conditions which brought about this accumulation were as follows:

1. The large annual formation of masses of organic matter due to the rich vegetation which forms owing to the abundance of nutritive substances in the soil of the steppe, which has been little subjected to leaching action.

2. Want of sufficient moisture to promote the rapid decay of organic substances.

3. The high content of the parent rock in calcium and magnesium, which contributes to the formation and preservation of the humus in the soil. The formation of the black soils is therefore chiefly characterised by negative reasons; absence of leaching, with however no injurious accumulation of soluble salts, and a very high percentage of humus.

Morphological Characters of the Tschernosiom. — 1. *Colour.* — The main colour of these soils is black, but a gray shade is clearly to be distinguished where the damper portions of the forest-steppe zone

appear, and a grayish chestnut-colour where the black soils of the driest districts alternate with chestnut soil.

2. *Composition.*—The surface is usually covered with a layer 2-4 cm. deep of a thick felt formed of rootlets mixed with a grayish dust derived from plants, sand and fine mineral particles. Beneath this (in virgin soil) occur two strata in vertical succession:

a) A dark uniformly coloured humus stratum 30-60 cm. deep and formed of small lumps having a diameter of 2-4 mm.

b) A much coarser and less homogenous layer which passes inperceptibly into the subjacent rock.

Classification of the Different Types of Tschernosium.—The black soils are classified under different heads according as to how far they express the characteristic method of formation of the type.

They may thus be divided into three groups.

1. Typical tschernosiom.

2. Chocolate-coloured or chestnut-coloured soil showing the characteristics of a desert-steppe formation.

3. Gray tschernosiom of the forest-steppe zone with the characteristics of the "Podsol" formation.

Mechanical Composition of the Various Types of Tschernosiom.—The data obtained by means of chemical analyses, according to the method of Schöne and Osborn, permit of the following groups being distinguished.

1. A compact-clayey black soil containing over 40 % of clay particles (diameter below 0.01 mm.).

3. A clayey black soil in which the particles below 0.01 mm. are between 25 and 35 %, and the silt (0.05-0.01) amounts to 50 % and over.

3. Light clayey black soil. Clay particles 20 %.

4. Loamy black soil; percentage of clay particles not exceeding 10 %.

Physical Properties of the Black Soils. — The writer, besides giving a large number of data, enters into a minute discussion of the physical properties of the Black Soils based on his personal observation, and on the works of numerous authorities.

The following table refers to the different groups of the Black Soils.

Physical Properties of the Tschernosiom.

Character of the Tschernosiom	Spec. Grav.	Weight of one litre of soil in gr.	Pressure Resistance in gr.	Height to which water rises in cm. after 10 Minutes	20 Minutes	30 Minutes	1 Hour	3 Hours	6 Hours	12 Hours	24 Hours	Time necessary for water to rise to a height of 30 cm. (h. m.)	Time necessary for water to penetrate a stratum 18 cm. thich (h. m.)	Water capacity of Soil	Greatest hygroscopicity per 100 gr. of dry soil	Hygroscopic water in air-dried soil
Loam (from plateau) . . .	2.330	1 152	2 450	4.6	6.2	6.8	—	—	20.6	28.3	—	14.25	16.15	55.35	9.0	4.11
Sandy loam	2.562	1 314	1 500	8.5	11.0	10.8	—	—	—	—	—	4.35	6 —	40.40	5.8	2.7
Rich, over loess-like loam .	—	—	—	4.2	5.3	6.2	7.9	11.9	15.8	20.8	26.7	33 —	3 —	—	—	—
Loam (on gentle slopes) . .	2.570	1 246	2 349	3.0	4.8	6.2	—	—	14.4	—	—	19.10	3.11	38.46	3.6	—
Sandy loam (from *stipa*-steppe)	2.500	1 205	—	7.5	9.5	11.3	14.5	—	—	—	—	—	0.23	48.16	—	4.90

Chemical Analysis of the Tschernosiom.

Type of Tschernosiom	100 parts of dry soil contain: Humus	Water in chemical combination	SO_3	CO_2	P_2O_5	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	Total
Loam (from plateau)	3.45	1.55	0.11	0.02	0.12	81.47	7.16	2.14	1.01	0.55	1.86	0.88	100.3
Heavy (from plateau)	7.84	2.87	—	—	0.28	64.40	13.12	4.62	1.41	1.58	2.22	1.33	99.7
Chestnut-coloured	4.66	3.74	—	—	0.15	65.90	13.12	5.50	2.15	1.88	2.21	0.51	99.8
Chocolate-coloured	4.03	3.94	—	0.19	—	64.85	15.61	4.00	1.94	1.49	1.98	0.92	99.0
Light loam.	7.93	2.76	0.33	—	0.45	55.57	19.81	5.10	1.57	1.62	2.13	1.68	100.0

Agricultural Properties of the Tschernosiom. — These soils, from their chemical composition, and their physical properties, are exceedingly well adapted to agricultural requirements. In spite of their fine structure, their characteristic granular nature permits of free passage to water and air alike.

Their richness in humus and clayey particles allows a considerable amount of water to accumulate in the superficial layers, and the granular structure prevents any stagnation. All the observations made, show that the productivity of these soils would be quickly reduced if their structure were altered by exaggerated and mistaken methods of working it. The black soils are rich in nutritive substances, and retain their fertility for many centuries. This is accounted for by their physical properties, which favour weathering, by the characters of the parent rock, and by the slightness of leaching. Another point tending to preserve the fertility is that years of heavy crops alternate with years of poor ones, in which little nutriment is removed from the soil.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY.

PISKUNOV, D. **The Effect of Topographic Conditions on the Development and Yield of Cultivated Plants.** (Vliianie Topographiceskikh Uslovii na Rasvitie i Uroxai Kulturnekh Rastenii). — *Sapiski Novo-Aleksandriiskago Instituta Selskago Khosiaistva i Liesovodstva.* (Journal of the Institute of Agriculture and Forestry at Novo-Alexandria), XXII Tom, 1 Vep,, pp. 46-100. S. Peterburg, 1911. 624

The writer gives the results of many interesting investigations carried out for the purpose of determining the action of the topographical factor on the growth of wheat, flax, and lupins, in the experiment field of the Agricultural Institute of Novo-Alexandria. He shows how the conditions of position act directly on the life of cultivated plants, and demonstrates for the above-named crops what had been already laid down by Voln for turnips, and by Petroff and Maidanik for sugar beets. **Russia**

Plants of different species behave differently under equal conditions of growth. Thus, wheat and flax do best on flat ground; on land with steep slopes, they show a marked preference for those

facing the West or North. The worst position for wheat is a slope facing south; for flax a slope facing east.

Lupins prefer uneven ground, and their best position is on slopes facing south (the worst for wheat), or east (the worst for flax). These differences depend on the plants' nature and especially on their root systems and on the way in which the latter re-act to the moisture, the temperature, and the light during the period of their growth. The plants with fine filamentous roots (wheat, flax) do badly on any kind of slope through want of water, which runs off all the more rapidly, the greater the quantity, and the steeper the slope. Flax especially, whose roots grow near the surface, suffers from the want of moisture, above all in places where, at the time of its maximum growth, the surface of the ground is driest, a thing which always happens on slopes facing east.

On the other hand the slender roots of wheat grow downwards to a considerable depth, hence the worst position for this plant is where the whole ground (not the surface only) is driest; and this happens on slopes facing south.

As regards flax, the general look of the plants, and the percentage of seedlings, show how a slope facing west, provides the best conditions of moisture and temperature, and how flax, when at its maximum daily growth, can get on with diffused light alone. Whereas wheat is not exacting as regards temperature and light, and does best on northern slopes.

The case is very different with plants like lupins, which have a large, well developed root system. They can reach the moisture far down in the soil, where the sun's evaporating power does not reach, at least during the first period of their growth. Hence they do best on southern slopes in the full morning sunlight.

On level ground, where there are varying conditions of moisture, temperature, wind, and light, the best results are obtained in low and sheltered positions. The only drawback is that wheat and flax may suffer from the sun's excessive power, and lupins from cryptogamic diseases.

In open high land growth is slow and incomplete. In the case of wheat and lupins the yield is scanty, while the flax harvest is abundant, but of very inferior quality.

From the above it is clear that flat ground as a rule provides the best conditions for the growth and yield of crops.

Those plants which require the sun, and which have strong well developed root systems, do best on slopes facing south or east, while on slopes which have the direct sun only in the afternoon they do not prosper.

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

Irrigation in France. — *Annales de l'Hydraulique et des Améliorations agricoles*, fascicule 33, pp. 46-96 et fascicule 34, pp. 348-351. Paris, 1905 et 1906. 625

HITIER, M. — *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, 111[e] année, T. 117, No. 1, pp. 110-126. Paris, Janvier 1912.

MÜNTZ, E. et LAINÉ, E. — *Comptes Rendus hebdomadaires des séances de l'Académie des Sciences*, T. 154, No. 8, pp. 481-497. Paris, 19 Février 1912.

I. — IRRIGATION IN PROVENCE.

In Provence irrigation plays a most important part in the utilization of the natural wealth of the soil. Especially the early crops, fruit, vegetables, seeds and flowers are irrigated. Lucerne and meadow grasses are also watered. France

A) MEADOWS IN THE CRAU DISTRICT. — The great gravelly plain of la Crau, about 130 900 acres in extent is bare of vegetation except where irrigation is practised. In the parts supplied with water from the Durance, which is conveyed by the Craponne, Alpines and other canals, fine meadows are to be seen even during the hottest months.

Irrigation is carried out from the 1st of April to September 30; every week from 5 to 10 cm. (2 to 4 inches) of water are used, which means about 13 000 to 26 000 mc. per ha. (185 900 to 371 800 cub. ft. per acre) during the season. Under these conditions three cuts are made which yield 7 500 to 8 000 kg. per hectare (60 to 64 cwt per acre) of dry hay. These results, however, are not obtained without the use of fertilisers also; in one year 12 tons per ha. (96 cwt per acre) of sheep dung are given, and in the next, artificials, consisting of 600 to 700 kg. of superphosphate and 100 to 150 kg. of sulphate of ammonia per ha. (4.8 to 5.6 and 0.8 to 1.2 cwt. respectively, per acre), and so on alternately.

The hay is mostly exported.

All the large estates of la Crau possess baling machines which allow the hay to be pressed into bales which are then sent, not

only to Marseilles, Arles, and Lyons, but even to Alsace and abroad. 7 500 kg. of hay per hect. (60 cwt per acre) give 500 to 600 fr. per hectare (£8 to £9.12*s.* per acre) gross returns, and it will be readily understood that whereas in la Crau unirrigated lands are let for 10 fr. per hect. (3*s.* 2 ½*d.* per acre), irrigated meadows command 150 fr. (£2.8*s.* per ac.).

To form a meadow, the land is first protected by cypress hedges, then it is broken up and the surface is prepared for irrigation by being divided by water channels into strips about 50 metres (162 feet) wide. Lucerne which forms the basis of the meadow is generally sown, in October, in wheat, together with other grass-seeds. The meadows last many years; in winter from November to February they are grazed by the flocks of sheep which descend from the Alps where they spend the summer, and if the Crau farmer has not enough sheep of his own he lets part of his meadows to his neighbours at the rate of about 60 fr. per ha. (19*s.* 2*d.* per acre) for winter grazing.

B) Irrigated crops in the Durance plain. — In the Durance plain, market gardens and meadows are irrigated. A great portion of the necessary water is supplied by the Carpentras Canal, which affords a striking example of the changes wrought by irrigation in the agriculture and general prosperity of a district.

The Carpentras Canal. The main canal is 89 kmet (about 53 miles) long, the secondary canals are 58 kmet (about 35 miles) and the total length of the supply ditches is 673 kmet (about 404 miles). The whole canal cost 4 700 000 fr. (about £186 000). The amount of water supplied by the canal at its lowest water mark is 6 cub. m. (211 cub. ft.) per second. An association of land owners exploits the canal, which is managed by a board of 11 members; the technical direction is conducted by an engineer who has under him one foreman, 9 sergeants and 48 guards. The land which can be irrigated by the canal is 16 600 ha. (41 000 acres) in extent; it is composed of gravel and of reddish sand, and was originally either bare or covered with some vineyards and stunted oaks.

These lands are generally porous and warm, and they utilise water rapidly and yield high returns. The extent of land belonging to the members of the association is about 5460 ha. (13 486 acres), bnt the ratio of the irrigated surface to the total was for a long time very low; 20 % in 1860; 43 % in 1880; 64 % in 1903; 76 % in 1910. The increase of the extent of the irrigated surface become general after 1903, in which year the irrigation Regulations were extended to the whole network of the canal. According to

these regulations, which take into due consideration the varying needs of the farms (nature of the soil and of the crops), the water is given in some cases once every 3 3/4 days, in others every 4 1/4, 5 1/4, 6 1/4, 7 1/2, 8 1/2, 10 1/2 and 12 1/2 days.

However much the intervals between the waterings may vary, each plot receives the same amount of water per unit of area. (During the year 1910 this amount corresponded to a theoretical continuous flow of 1.25 litres per second and per hectare (0.178 cub. ft. per second per acre) (1).

Price of irrigation water. Two rates are levied: one, for the upkeep of the canal, which amounts to 3 fr. per hectare (11.56*d.* per acre) and is paid for all the 5460 hect. (13 486 acres) of land represented by the association, the other 32 fr. per hect. (10*s.* 2 3/4 *d.* per ac.) is paid only for the land which is irrigated.

Irrigated Crops. The 4 100 ha. (10 127 ac.) which are irrigated, belong to 7 600 farmers and bear the following crops:

Natural pastures . .	1 657 ha. (4 093 acres)	Strawberries.	763 ha. (1 885 acres)
Grass leas	339 » (837 »)	Gardens . .	102 » (252 »)
Annual Crops. . .	1 144 » (2 826 »)	Vineyards .	95 » (235 »)

Irrigation competitions. The Carpentras Agricultural Society, in consequence of the continuous increase of irrigation, has organised a competition among the land-owners and farmers of the district. This competition has had the result of showing the rich and varied produce that can be obtained from irrigated lands. This is also shown by the high prices that such lands fetch in the market, namely from 4 000 to 7 000 fr. per ha. (£64 to £102 per ac.). The small number of farmers is also worthy of notice; of the 120 persons who entered for the competition only 42 were farmers, as against 78 owners, and it may be taken for granted that these 42 farmers hope soon to become owners.

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(1) This is the theoretical amount during the whole period of irrigation which is 183 days (from April 1 to October 1), and it corresponds to about 19 600 cub metres per hect. (280 280 cub. ft. per ac.), which is distributed to the various crops in a certain number of actual waterings.

This theoretical amount in used in France as a measure for the payment of the water supplied. In the United States and in Canada the quantity of water supplied is measured by the height which it would attain if given to the soil at one irrigation, and without losses of any kind. See *B.* March 1912, No. 487. — *Irrigations et Drainages* par RISLER et WERY, pp. 279-280, Paris 1909. (*Ed.*).

Cultivation of Strawberries at Carpentras (1). Among the most remunerative crops of the Carpentras district strawberries rank high. The production of this fruit, which in 1888 was 210 000 kg. (206 tons) rose in 1905 to 3 400 000 kg. (3 246 tons). The rights of irrigation, which formely were worth 70 to 80 fr. per ha (22*s.* 4 $^3/_4$ *d.* to 25*s.* 7*d.* per acre) vary now between 500 and 600 fr. (£8 to £9.12*s.* per ac.) again showing the connexion between irrigation and the prosperlty of the country, Strawberries are irrigated from the middle of March to October. Before the harvest they are watered twice a weck, afterwards only once. In Mr. Batailler's farm at Monteux, 270 ares (about one third of an acre) are under strawberries, the land is divided into beds 120 metres (390 ft.) long with a fall of 0.50 m. (19 ½ inches) or about 4 per 1000. At the higher extremity of the bed the supply ditch in situated, it is built of cement and bordered by a foot path. The water outlets, 10 metres (32 feet) apart are provided with metal sluice-salves, and stoneware conduits for the crossing under the foot-paths. The installation expenses amounted to 3 000 fr. per ha. (£48 per acre) the working expenses are about 2 500 fr. per ha. (£40 per ac.) per annum, and the yearly profit 2 800 fr. (£44.16*s.* per acre).

II. — Scientific research on the frequency of irrigation and amount of water to be applied, according to the nature of the soil.

The want of success which has attended some irrigation schemes has not been due, as some believe, to the quality of the water employed, but to the physical nature of the soil, and chiefly to its degree of permeability. Thus the prosperity of the region served by the Saint Martory canal which starting from the Pyrenees reaches as far as Toulouse, has actually decreased since the opening of the canal. This is due to the low permeability of the soil which only partially absorbs the water it gets, and thus becomes swampy. Similarly the area watered by the Bourne canal on the left bank of the Rhône, below the Isère, reaps but little benefit from the water it receives.

The soil is extremely permeable and water sinks into it, hardly wetting the surface for which it is intended. It follows that the study of the physical properties of the soil should form part of

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(1) See *B.* January 1911, No. 151; May 1911, No. 1428; August-September-October, 1911, Nos. 2652, 2655, 2656. (*Ed.*).

every preliminary survey, so as to ascertain in the first place whether the making of a canal would be beneficial, and then the volume of water to be brought, the duty and the mode of distribution to be adopted.

Irrigation water is couveyed by laterals to the land it is to supply. The amount of water flowing from these is successively placed at the disposal of the various farmers, during a certain time, and proportionally to the area to be watered. To ensure the highest duty of the water it is necessary to calculate with precision: 1. the amount of water forming the unit of irrigation; 2. the length of time each watering employs, which with the unit, determines the volume of water used; 3. the interval of time between each watering of the same plot, which interval limits the surface watered by the lateral.

Precise data for these calculations are rarely in the possession of the engineers entrusted with the preparation of irrigation canal schemes; and they mostly apply the same uniform rules for soils of different natures. During the last years Messrs. Faure, Müntz and Lainé have devoted themselves to the scientific determination of these data. The problem is very complex; and up to now it has only been studied in connexion with meadows and with irrigation by owerflow channels. The experimenters have established numerous experiment fields in different types of soil and in districts where irrigation has long been practised. They have examined the physical nature of the soils; they varied the volumes of water and the intervals of time between successive waterings and determined the influence of these variations on the crops.

Different soils may be classed according to their permeability; for this a scale has been drawn up, in which each degree corresponds to 1 centimetre (0.3937 inch.) of water absorbed in one hour. By means of this scale the various experiment fields have been classed as follows:

Stations	Permeability
Fourcadel	0.05 to 0.19
Ondes	0.60
Cavaillon	2.00
Carpentras	3.10 to 12
Valence	50 to 60

In each experiment fileld determinations were made: 1. on the optimum quantity of water for the yield of the crops, when the interval of time between successive waterings was the same; 2. The

influence on the crops of the same total amount of water, but distributed in more or less frequent waterings.

Amount of water to be applied at one time. In each experiment field 4 plots or "calants" (1) were prepared and irrigated as long as was necessary for the water to reach the lower end of each plot. The time required was carefully noted, and thus the minimum volume of water capable of watering a given surface was ascertained. This volume varies with the physical nature of the soil as the following table shows:

Stations	Permeability	Number of cub. met. for 1 ha.	Number of cub. ft. for 1 acre
—	—		
Fourcadel	0.05 to 0.1	150	2 145
Ondes	0.60	350	5 005
Cavaillon	2.00	360	5 148
Carpentras	3.00	460	6 578
»	10.00	570	8 151
»	12.00	550	7 860

The above quantities of water being taken as a unit, at every watering, plot no. 1 received this volume, plot no. 2, one and a half times as much; plot no. 3, twice as much; while plot no. 4 was not irrigated and was kept as control.

The following are the yields of dry hay in kilogrammes (2.2 lb.) per hectare (2.47 acres) for the last three years. The figures for Fourcadel and Ondes refer only to the two last mowings.

Stations	Permeability	With 1 vol.	With 1, 5 vol.	With 2 vol.	Control, without irrigation
—	—	kg.	kg.	kg.	kg.
Fourcadel . . .	0.05 to 0.1	3 930	—	—	1 345
Ondes	0.60	4 189	3 870	3 897	700
Cavaillon . . .	2.00	12 842	13 390	13 090	5 666
Carpentras . . .	3.00	13 712	14 030	12 890	2 677
» . . .	10.00	14 247	11 699	13 277	4 762
» . . .	12.00	13 123	13 149	12 030	5 411

(1) Irrigation by "calauts" is a method which can be advantageously employed in plains having a regular slope between 1 per 1000 to 2 per 100. This method consists in opening, obliquely to the contour lines, supply ditches having a section which delivers the unit of volume adopted for irrigation. These ditches are situated 10, 20 and 60 metres (32 ft. 6 in., 65 and 195 feet) apart, according to the permeabiiity of the soil. The space between them is divided into plots, called "calants", 10 to 15 metres (32 ft. 6 in. to 48 ft. 9 in.) wide, by means of little embankments 1.50 metres (5 ft. 3 in.) wide and 0.10 metres (4 inches) high. These embankments spread the water uniformly and do not hinder the passage of agricultural machines. See *Irrigation et Drainages* par RISLER et WERY, p. 218, Paris 1909. (*Ed.*).

Watering with one volume is thus the most advantageous. If in some cases a greater yield was obtained by more copious irrigation, the increase was not proportional to the greater amount of water. Any excess constitutes a loss of water which might be injurious or might be utilised on other areas; besides, by flowing away in the drains, it impoverishes the soil. This point is of the highest importance for utilizing to the utmost irrigation water.

Frequency of irrigation. The greater or lesser frequency of waterings influences the yield of hay, as may be seen from the following table, in kilogrammes and hectares, in which the figures for Fourcadel and Ondes refer only to the two last mowings:

Stations	Permeability	Yield per hectare, watering every				Control without watering
—	—	3 $^{3}/_{4}$ days kg.	7 days kg.	15 days kg.	22 ½ days kg.	kg.
Fourcadel . .	0.05 to 0.1	4 075	3 930	3 600	2 410	1 375
Ondes	0.60	3 460	4 287	3 820	2 400	710
Cavaillon . .	2.00	12 827	13 541	11 939	12·005	5 721
Carpentras . .	3.00	13 888	13 680	11 026	9 662	3 340
» . .	10.00	15 578	13 882	12 201	10 086	4 429
» . .	12.00	12 978	12 078	11 246	8 413	4 009

The above clearly shows that though the most frequent watering often increased the yield, this increase is neither sufficiently important nor regular to pay the extra labour. Generally, one irrigation every 7 or 8 days, is the most advantageous. Less frequent watering diminishes the yield considerably.

Continuous flow. When the volume of water employed for each watering and its frequency are known, the total quantity of water required during the whole season (April 1 to October 1) may be easily calculated. If this volume be reckoned per unit of surface, the hectare (2.47 acres), and of time, the second, the theoretical *continuous flow* is obtained. According to the experiments made this flow ought to be in litres (0.0353 cub. ft.):

For Fourcadel, 0.23 litres instead of 0.75 as according to the regulations.

For Ondes, 0.54 litre, flow not fixed.

For Cavaillon 0.55 litre flow not fixed.

For Carpentras 0.71 to 0.85 litre instead of 1.25 litres, as according to the regulations.

Varying thus with the physical nature of the soils. From the above it is evident that there is generally a positive waste of water. In the general interest the use of water should be limited to the

quantity that is really useful so as to extend its benefits to the greatest possible surface.

At the station for the study of plant chemistry at Meudon, the quantity of water evaporated for the formation of one part in weight of dry produce was ascertained to be 550 times as great. According to this ratio, in order to obtain the increase of yield given by irrigation, the following quantities of water would be required:

Stations	Increase of yield		Quantities of water: Evaporated by the crop		Quantities of water: Usually applied	
—	kg.	cwt.	m^3	cub. ft.	m^3	cub. ft.
Fourcadel . . .	2 700	53	1 485	52 420	5 880	207 564
Ondes.	3 500	69	1 925	67 952	3 500	123 550
Carpentras . .	10 000	197	5 500	194 150	20 700	730 710

There is thus great waste in the amount of water applied.

If the above calculations be repeated for a crop of aftermath hay during a period of extreme drought the following figures are obtained.

Stations	Increase of yield due to irrigation		Number of waterings	For each watering: Volume of water usually given		For each watering: Volume of water utilized by the plants	
—	kg.	cwt.		m^3	cub. ft.	m^3	cub. ft.
Fourcadel . .	2 200	43.29	6	490	17 297	202	7 130
Ondes.	2 225	43.83	4	500	17 650	306	10 802
Carpentras . .	4 330	85.30	8	830	29 300	298	10 520

These figures show that the amount of water usually given is considerably in excess of that really required by plants. It is not to be expected that in practical farming the ideal amount can be given, and no more; but all efforts should be made to get as near this as possible.

626 LEGG, W. A. **Irrigation in South Africa.** — *Journal of the Royal Society of Arts*, No. 3090, pp. 327-344. London, February 9, 1912.

Union of S. Africa

The Union of South Africa contains some 473 000 square miles. In the year 1910 there was imported into the country over sea, agricultural produce, including grain, meat, milk, butter and cheese, etc., of the value of over three million pounds sterling. The principal causes of the lack of progress in agriculture and

consequently irrigation in the South African Union are the following: the distribution of the white popolation but thinly scattered throughout the country; adverse climatic conditions; difficulties of transport, the trunk lines of the country having been constructed for the exploitation of its mineral wealth; legal difficulties which prevent the development of irrigation by giving rise to much litigation among the landed proprietors. For these reasons the country has retained almost entirely a pastoral character.

The growing of crops without artificial watering can only be attempted in some of the more favoured portions of the country, and is limited to wheat, oats, and barley.

The south western portion of the Cape Colony, and what is known as the conquered territory in the Orange River Colony, are almost the only large areas where wheat growing on the rainfall is carried on.

The Orange River Colony is able to produce wheat on the rainfall along the Caledon River, but the Transvaal grows practically none. Maize (mealies) is produced on the rainfall in the Transvaal, Orange River Colony, and Natal.

As a substitute for irrigation, experiments in dry farming are in progress, undertaken by both State and individual farmers.

The mean annual rainfall of the Cape Colony is about 15 ins., that of the Transvaal about 29 ins., of the Orange River Colony 21 ins., and of Natal about 34 ins. The mean for the whole of the Union is probably about 20 ins. per annum.

The total area irrigated now in Cape Colony is about 500 000 acres and at least two million acres might be irrigated. In the Transvaal about 100 000 acres are now under irrigation; there is plenty of scope for irrigation extension in both the Transvaal and Orange Free State.

The Irrigation Act of 1906 is the statute at present in force. It legislates for intermittent streams, as well as for perennial ones. It takes away the absolute ownership in an intermittent stream from the person on whose land it flows, and prevents him from leading away the water of such stream for use on non riparian lands, except by permit from the Water Court in case of surplus water. It also allows prescriptive rights in the water to a lower owner on to whose land some of the water has flowed for a period of thirty years. The act further makes provision for the diversion of the surplus water of a perennial stream across a water shed. Thus, whilst curtailing to some extent the use of the intermittent stream, the act extends the use of the perennial water. It gives to the government, and to some extent to river and irrigation boards, the

power to expropriate land for irrigation purposes on payment of compensation to the owners, allows boards and individuals to claim servitudes or easements on the lands of others, and makes provision for the granting of government loans to boards or individuals for irrigation purposes.

Almost the whole of the cultivated land in the Union, with the exception of a strip along the coast, lies at from 2 000 to 6 500 ft. above sea-level.

In the Cape Colony the aromatic herbage of the veld is of excellent quality, though its quantity, owing to lack of moisture, is often less than desirable. In the Orange River Colony and the Transvaal some of the grasses afford good pasture, while others are more or less injurious.

Among the earliest efforts at irrigation a canal from the Breede River in the Cape Colony may be mentioned.

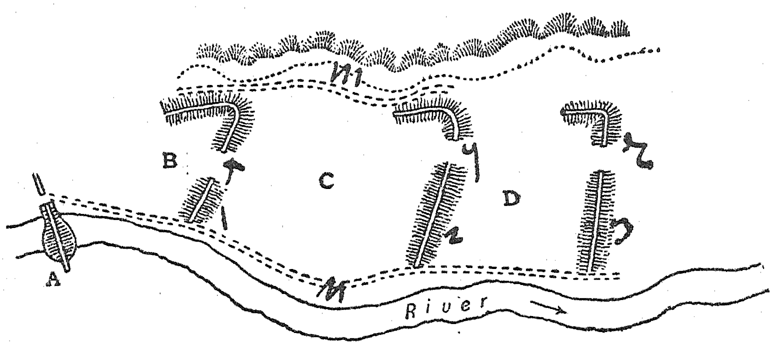
The Oudtshoorn district has been so much improved by irrigation that with the cultivation of lucerne under irrigation, ostrich farming has become very important and is now extending gradually throughout the whole country as may be seen from the following figures:

In	1865	there	were	about	80	tame ostriches	in the country
»	1875	»	»	»	21 750	»	»
»	1891	»	»	»	154 880	»	»
»	1904	»	»	»	357 970	»	»
»	1910	»	»	»	500 000	»	»

In 1908 over £2 000 000 worth of feathers were shipped from Cape ports. In addition to lucerne, tobacco, fruits and vegetables have been cultivated under irrigation.

An interesting method of irrigation is practised in the northwest of Cape Colony, particularly along the valley of the Zak River. It is called "Zaai dam irrigation" and has been compared to the basin method of irrigation in the Nile Valley, on a small scale.

The spreading of the water is aided by the curious circumstance that the land often falls away from the river banks. This condition is brought about by the fact that the river more often floods the land near to its banks than that more remote, and forms deposits of silt which gradually raise the level of the lands adjacent to the river. Irrigation is carried out by throwing a temporary weir across the river in *A*; the water floods the land in *B* and thence into *C* and *D*, either by means of two canals *m* and *n* or by *x*, *y*, *z*, gaps cut in the low embankments 1, 2 and 3. (See fig. on next page).



Lately the government has aided and encouraged irrigation from boreholes and wells, especially in Bechuanaland and the Transvaal.

The following table gives some idea of the progress of irrigation from 1891 to 1906, that is, up to the passing of the Irrigation Act of 1906.

	Area irrigated in acres	
	In 1891	In 1906
From small dams, wells, boreholes etc.	48 000	50 000
From perennial streams	192 000	230 000
From intermittent streams	69 000	140 000
Total area . . .	309 000	420 000

Since the passing of the Irrigation Act about 100 000 acres have been put under irrigation in the Cape Colony alone.

One of the largest irrigation works in the country now being constructed is the one near Britstown. It is being built by a syndicate and will include a storage reservoir on the Ongers River, with a capacity of over 3 000 million cubic feet. The dam will be about 60 ft. above the river bed.

The twelve new irrigation districts include some 37 000 acres of land, and several other large schemes are being investigated.

Besides the above, irrigation by pumping is also receiving attention. It is very simple, in some cases, if a pumping plant can be put down adjoining the irrigable land, as by that means the capital outlay may be much reduced and complications with neighbouring proprietors avoided.

During the three years 1907, 1908 and 1909, sixty-three pumping schemes were prepared, which, in the aggregate, cost £41 000 and irrigate some 6 000 acres; about £20 000 of the total cost was loaned by the government. Of these sixty-three installations, fifty were suction gas-power plants, which have generally given much satisfaction. A good many others of a similar nature have been carried out without government aid. About 140 are plants driven by oil engines. Where irrigation by a gravitation scheme is not practicable pumping can render most valuable services.

627 RINGELMANN, MAX. **Irrigation by Sprinkling in Horticulture.** (L'irrigation par aspersion en horticulture) (1). — *Revue Horticole*, 48e Année, Nos 2 et 3, pp. 34-36 et 64-65. Paris, 16 Janvier et 1er Fevrier 1912.

France

As rain does not always fall when required by plants, recourse must often be had to artificial watering, of which one of the best forms is *irrigation by sprinkling;* for this purpose, special installations are used, which allow the volume of the drops of water, their velocity and the inclination of their fall to be modified at will.

The Author studied the effect of rain and of artificial sprinkling upon the *settling of the soil* and arrives at interesting practical conclusions. For the same rain (number, velocity and diameter of the water drops) the settling varies with the nature of the soil; some heavy soils settle a good deal and present a hard crust.

The following are some figures as to this superficial caking:

Soil	Settling of the soil in millimetres
Very stony	0, or not measurable
Sandy	4.5
Medium	7.5
Chalky	10.—
Clay	15.—
Garden mould	17 to 18.

(1) See *B.*, March 1912, No. 486. (*Ed.*).

Settled soil has an unfavourable action on the further utilisation of rain or irrigation water, for such a soil loses by evaporation 1 ½ times more water than the same soil when its component parts are loose, as after having being hoed. This evaporation causes besides a loss of heat in the soil. Consequently after a heavy rain or violent watering it is advantageous to hoe the soil between the plants.

When hoeing is not possible because too expensive, the settling of the soil in market gardens may be diminished by covering the ground with a protective mulch which may consist of straw, dry leaves, peat, moss or other vegetable matter. By this means the compression of the surface is very considerably reduced, and much less water is lost by evaporation. The same effect would be obtained if the surface of the ground were covered with coarse materials such as rubble or slag.

Apparatus for automatic watering. — Watering by sprinkling does not require any special arrangement of the ground and it may be used for all kinds of market garden produce, but it entails a heavy cost of labour which can only be borne by very valuable crops.

With a view to limiting this expense M. A. Couton (Chateau de Lamothe, Villeneuve-sur-Lot) has devised a system of automatic watering which has been applied in some gardens in the neighbourhood of Paris.

In the garden *A* (fig. 1) a system of pipes consisting of a main *C* and branches *l*, *l'*, *l''*.,., has been put down and connected with a reservoir *B* situated at a higher level. The branch pipes which are fitted with nozzles *a* are situated at a distance from each other equal to the width of the beds to be successively watered, by the automatic opening of the cocks *b*, *b'* *b''*... brought about by the mechanisms *m*, *m'* *m''*...

At the commencement of operations the cock *b* is opened, whereupon all the nozzles of the line *l* begin to play; after a certain time, which can be regulated beforehand, the cock *b* is turned off automatically by the mechanism *m*, and, by means of the wire rope *n*, the cock *b'* is opened and waters the next bed through the nozzles on *l'*; then cock *b'* is turned off and by means of the cable *n* and the pulley *k'*, the cock *b''* is opened and waters the next bed, and so on.

The nozzles revolve by the reaction of the water jets, and water the ground as with a fine rain, and very regularly.

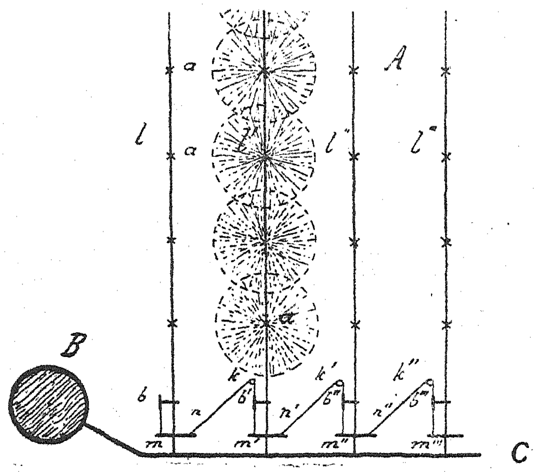


Fig. 1. — Plan of automatic watering.

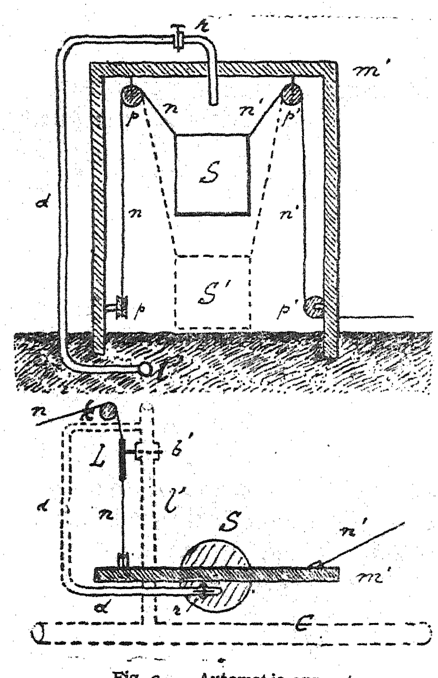


Fig. 2. — Automatic apparatus.
(plan and elevation)

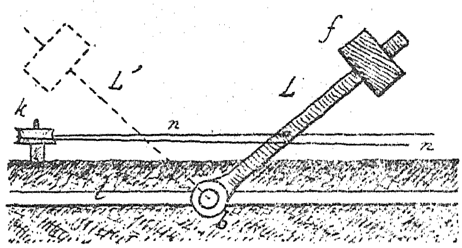


Fig. 3. — Automatic cock.

Description of the automatic mechanism for opening the cocks b, b' b''...

All the mechanisms *m, m', m''*, (fig. 1) are identical. Each of them consists of a vessel *S* (fig. 2) suspended at a certain height above the ground by the galvanised wire ropes *n* and *n'*; the pipe *d* opening over the vessel is fixed on the pipe *l'* beyond the cock *b'*. The wire ropes *n* and *n'* run on the pulleys *p* and *p'* are respectively connected: *n* with the lever *L* which works the cock *b*, and *n'* with the lever of the next adjoining line.

A support *m'* bears the pulleys *p* and *p'* and the pipe *d*. When the cock *b'* is open, the others being shut, only the nozzles on *l'* act and the bucket *S* gets filled with water issuing from the pipe *d*. The flow being regulated by the tap *r*. When a certain quantity of water is in the bucket its weight causes the latter to descend to *S'*; the wire rope *n* pulls the lever *L'* (fig. 3) into the position *L* and shuts the cock *b'*; the rope *n'* (fig. 2) pulls the lever of the next set. Meanwhile the bucket in *S'* is emptied by tipping or otherwise.

The descent of the full bucket of *m'* (fig. 1) caused by the lever *L* and rope *n* (fig. 2) causes the empty bucket of *m* (fig. 1) to ascend. In the same way the ascent of the empty bucket of *m'* is caused by the descent of the next one, and so on. The lever *L* (fig. 3) bears a counterweight *f* to prevent its stopping vertically at a dead centre. The ropes *n, n' n''* work in iron pipes.

From the above it will be seen that in order to water successively the whole surface it is enough to open one cock, the one belonging to the first pipe nearest the reservoir.

The length of time during which the watering is to be carried out on each plot, is regulated by the tap *r* which, by being more or less opened, employs more or less time in filling the bucket.

This system permits of watering being done during the night, which is often advantageous; it allows also, by the removal of one of the wire ropes, of watering only that part of the land comprised between the point at which the water arrives and the length of rope that has been removed.

With a head of 19 to 23 feet of water each nozzle waters a circle having a radius of about 20 feet; thus 56 to 60 nozzles are required per acre. The total cost of such an installation including water pipes amounts to about £64 per acre. which is not much considering the great amount of capital required by market gardening; the labour bill is considerably diminished, because for ordinary hose watering a man, paid about 5*s* a day, is necessary for 1 ¼ acre, whilst the above described installation only requires regulating and starting, and little or no surveillance.

The water pipes may either be deeply embedded in the soil so as not to interfere with the work or they may be merely placed on the ground, in which case they may be easily disconnected and removed when glass frames are to be used.

628 DE ANGELIS D'OSSAT, GIOACCHINO. **Water in Calcareous Soils. The Springs of Caposele, Province of Avellino, Italy.** (Le acque dei calcari. Le sorgenti di Caposele). — *Bollettino della Società geologica italiana*. Vol. XXX, Fasc. 3°, pp. 479-492 + 1 tav. Roma 1912.

Italy

The author has investigated the power of dissolving limestone, possessed by water that has percolated through vegetable soils in general, and through forest soil in particular, and compares this power with that of rainwater. With this object he conducted the following experiments:

In each of three glass vessels he placed 25 grams of pure powdered limestone, and then filled them up with equal quantities of three different kinds of water, namely in one glass rainwater, and in the other two the same rain water, 1 litre of which had percolated in 10 hours through an equal volume of soil, taken in one case from a conifer wood and in the other from an oakwood, in each case from an area of 1 square decimeter (15.5 square inches) (the quantity of water corresponds to the amount which would fall during a short period of abundand rain). After two months and a half these waters were filtered and analyzed; the results were as follows:

Water	Total hydrotimetric degree (French)	Solid residue at 100° in grams per litre	Putting the value for rainwater as 1 the ratios of the other waters become:	
			Hydrotimetric degrees	Residue
Rainwater	12°	0,056	1	1
Conifer wood 3 cm. (1.1 inch) of dead leaves etc. 7 cm. (2.7 in.) of vegetable mould; conglomerate subsoil . .	19°5	0,196	1,62	3.33
Oak wood 2 cm. (0.8 in.) dead leaves etc. 8 cm. (3.1 in.) of vegetable mould; conglomerate subsoil	24°	0,290	2	5,17

In another experiment, with the same quantities as in the first experiment, distilled water was filtered through soil taken from a wood composed of common, Turkey and evergreen oaks, situated on a marl subsoil. The water thus obtained was divided into parts which stood to each other as $1 : 2^3 : 3^3 : 4^3$. Into each of these, and into a vessel containing distilled water, 25 grams of the same powdered limestone was placed. The total hydrotimetric degree (French) and the solid residue at 100° C. were determined after 31-32 days, and the last sample also after 64 days.

The results of the two experiments agree in showing that rain water or distilled water after having filtered (for 10 hours, height 10 cm.) (4 inches) through a shallow layer (10 cm.) of forest soil, neither acid nor poor in lime, acquires a greater solvent power, which increases with time (up to about one month) becoming 5.17 and 3.56 times greater than that possessed by rain water and distilled water respectively. This increase of solvent power will increase, in like proportion, the energy with which the infiltrating water widens and deepens the subterranean network of water channels, which tends always to sink lower down.

After having filtered through forest soil the water showed the following increase:

	In hydrotimetric degrees	In solid residue at 100°
I Experiment	1-2	1-5.17
II »	1-1.57	1-3.56

Now it has been demonstrated (Fleck, Fedor, Falk, Soyka, von Rigler) that the hardness of water is an index of its impurity. Consequently the most wholesome drinking water is that derived from rain water which has filtered through the least possible depth of vegetable soil and with the greatest rapidity, especially when the underlying rocks are limestone and easily traversed. The water springing from limestone will be all the better if the catchment basin is bare of all vegetation. In the event of reafforesting such a basin, the neighbourhood of its issue ought not to be rewooded, nor should the land a little above the out-crop level be planted with trees, when the spring is of the so-called over-flow type.

It is to this type that the sources of the Sele, which will feed the Apulian aqueduct, belong, (1) and the author considers them in connexion with the principles laid down in this paper.

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(1) See *B.* Aug-Sept-Oct. 1911, No. 2388. (*Ed.*).

The rocks which crop out in the neighbourhood of the springs are cretaceous limestone, regularly soluble and their residuum is but little adapted as a filter for water.

The author is of opinion that an excessive reafforestation of the catchment area would cause: a change in the chemical composition of the water, a diminution in its quantity, and a sinking of the subterranean network of water channels. And this is all the more likely to happen, for the limestone, near the outcrop of the water, is in contact with clay schists containing pyrites ; and an experiment carried out by the author has demonstrated that the presence of schists, especially if containing pyrites, increases the solvent power of water on limestone (rendering it in some cases as much as 5.23 times greater).

629 Egypt

Hydraulic Works and Cotton Production in Egypt. — See below No. 657.

MANURES AND MANURING.

630

WRIGHT, R. PATRICK. **Experiments on Manuring, on Inoculation, and on Applying Lime to Arable Land, in Scotland.**

Great Britain: Scotland

1. Report on Experiments on the Manuring of Potatoes in 1907 and 1908. — 2. Report on Experiments on the Manuring of Turnips in 1906 and 1907. — 3. Report on an Experiment on the Cultivation of Lucerne in Scotland and on the Effects of Inoculation. — 4. Report on Experiments on the Improvement of poor permanent Pasture by Manuring. — 5. Report on Experiments (a) On the best Method of Applying Lime to arable Land; and (b). On the relative Economy of Ground and Slaked Lime). — *West of Scotland Agricultural College, Tenth Report*; *Bull.* 51, 52, 53, 54, 55; pp. 107-221 tbl. XIV. Glasgow ,1911.

(The figures in the text marked with an * refer to the above Reports).

Practical experiments on a large scale and with the co-operation of the owners, on a common plan. Soil light, sandy or sandy loam in the central and south western counties of Scotland.

Experiments on the Manuring of Potatoes. — 1*. The Experiments were made on 17 farms in 1907 and on 14 in 1908. Principal results obtained:

1. Good crops of potatoes may be obtained with farmyard manure alone; and the return is equally profitable when the manure is applied in small (10 tons par acre) or in large dressings (20 tons per acre).

2. Larger and more profitable crops can be grown by small dressings of farmyard manure with the addition of a suitable mixture of artificials.

3. The most successful and profitable mixture of artificials employed in the experiments, and applied in addition to 10 tons farmyard manure per acre, consisted of:

3 cwts superphosphate (30 per cent soluble); basic slag, soluble in citric acid, in the same proportion as the superphosphate;
1 ½ cwts sulphate of potash (94 % purity);
1 ½ cwts sulphate of ammonia.

4. In the above mixture 1 ½ cwts sulphate of ammonia gives a larger and more profitable crop than 1 cwt only.

5. The application of half the phosphate included in the mixture in the form of basic slag, instead of the whole in the form of superphosphate, gave a somewhat better return.

6. Neither the 30 % potassium salt nor muriate of potash proved such a suitable or profitable potash manure for the potato crop as sulphate of potash of 94 % purity.

7. Calcium cyanamide when applied per acre in quantity containing the same amount of nitrogen as 1 cwt sulphate of ammonia, showed itself on a number of farms to be quite as effective or even more so, than the latter manure, but on other farms was distinctly inferior. But when applied in a 50 % greater quantity, it produced no further increase in crop, and showed itself to be less effective than sulphate of ammonia applied in equivalent quantity.

8. Nitrate of lime gave results in one year almost equal to those produced by sulphate of ammonia.

9. Calcium cyanamide and nitrate of lime are deserving of further investigation as sources of nitrogen supply for the potato crop.

10. Nitrate of soda gave an increase in the potato crop practically equal to that produced by sulphate of ammonia.

Manuring of Turnips. — 2*. Experiments carried out on 16 farms in 1906, and on 20 in 1907.

The following conclusions may be drawn:

1. That phosphoric acid applied to the turnip crop, half in the form of superphospate and half as basic slag, will produce a crop as large as if the phosphoric acid were applied wholly in the form of superphosphate.

2. That a sufficient quantity of potash in a turnip manure is essential to the production of large crops, and that the omission to supply potash causes a large reduction both in yield and in profits.

3. That 30 % potash manure salt is as effective as kainit for the supply of potash to the turnip crop.

4. That, on the average of the farms, nitrogen also produced an increase of crop, but it proved to be less important and less effective than potash. The effects of the nitrogenous manures varied with the season, and the condition of the soil and the manner of application. Thus the use of nitrate of soda as a top dressing is not wholly supported by the results of these experiments. The effects seem to vary with the season. On the whole the best results have been obtained by the application of nitrate of soda in the drills.

5. Calcium cyanamide proved itself an effective turnip manure; in 1907 it showed itself as valuable as nitrate of soda or sulphate of ammonia. Applied to soils for which it is adapted it appears capable of giving results on the turnip crop superior to either of these manures (1).

Improvement of poor permanent pasture by manuring. — 4*. Experiments made on two different soils, one a thoroughly drained moss land, the other a light stony loam lying in parts close to the rock. In 1904 artificial manures were applied and the effects produced during the following seven years were determined by the numbers of sheep carried on the plots, and by the increase of live weight made by the sheep, compared with that of the animals on the unmanured plots.

The conclusion to be drawn from these experiments are as follows (2):

1. Both on moss land and on poor stony loams, poor permanent pastures can be greatly improved by applications of suitable quantities of basic slag and kainit, and these artificials may be applied in such quantities as were used in this experiment, *i.e.* about

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(1) See: *B.* March 1912, No. 491. (*Ed.*).
(2) See: *B.* June 1911, No. 1729. (*Ed.*).

10 cwts basic slag containing 200 lbs phosphoric acid and 8 cwts kainit (containing 100 lb. potash) per acre.

2. On moss land kainlt added to the basic slag greatly increase the returns and the profits, and produces a more lasting improvement on the pasture.

3. On the contrary, on the poor stony loam while the effect of the two artificials is somewhat greater, the advantage of adding kainit may not on such soils prove sufficient to defray the cost. The application of basic slag alone gives a profitable return; the improvement lasting a number of years in gradually decreasing amount.

One of the most important effects of the basic slag, and more especially of the basic slag *plus* kainit on pastures is the effective destruction, within two or three years, of mosses (fog) (1).

Some special experiments were also made by the author at the Experiment Station of the West of Scotland Agricultural College.

Introduction of the cultivation of Lucerne and the effects of inoculaticn. — 3*. The results of the experiments show that, contrary to the general opinion, there is nothing in the climate of the West of Scotland to prevent the successful cultivation of lucerne, and the consequent enriching of the soil with a large quantity of nitrogen, provided suitable methods be followed. It was also proved that the application of a bacterial culture is the most economical means of enabling the lucerne plants to obtain the nitrogen they require.

The best and most economical method of applying lime to arable land. — 5*. Experiments were carried out from 1902 to 1909, through a rotation of eight crops, on a light loamy soil in high condition. The most important results were the following (2):

1. On land deficient in lime, its application will increase the yield of crops, but the amount of increase obtained will depend on the quantity of lime given, the method of applying it, and the kinds of crops grown.

2. Large dressings of not less than 4 tons per acre applied at long intervals of time are much less effective than the same quantity of lime applied more frequently in divided doses, and, according to the experiments conducted by the author, they are not likely to be profitable. The largest increases of crops were obtained from annual applications of 10 cwts burnt lime per acre. Applications of 5 and of 10 cwts per acre, per annum, gave profit-

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(1) See *B.* February 1912, No. 335. (*Ed.*).

(2) See *B.* April, No. 1144. (*Ed.*).

able results, but the larger dressings of 1, 2, and 4 tons per acre proved very unprofitable.

3. As for the different crops, the direct application of lime to the turnip crop produced a large increase in the yield, and the larger the quantity of lime given, up to 4 tons per acre, the greater was the increase. A dressing of 10 cwts per acre proved however, most profitable.

On the hay crop lime applied to previous crops was beneficial, but lime applied on the young seeds tended to diminish the yield of hay, except when given in small qnantity.

On all the cereal crops liming exercised a beneficial effect, it increased the yield of grain, but the yield of straw underwent some diminution. The wheat crop benefited most and barley least. The oat crop occupied an intermediate position. On potatoes, on the contrary, the effect of liming was invariably injurious, and caused a diminution of the crop, even when applied in such a small quantity as 5 cwts per acre. Liming is therefore to be avoided for potatoes. If applied at all it should be put on the soil as many years before the potato crop is to be grown as the rotation admits.

4. Gas lime applied at the rate of 4 tons per acre to the turnip crop produced a considerably smaller increase than an equal weight of burnt lime, but in the seven succeeding years of the rotation it gave a total increase of more than three times the value of that produced by burnt lime, and on account of its low cost also it gave much more profitable returns than any other lime dressing used in the experiment.

As for the relative economy of ground and slaked limes, the author gives the following table of the costs of the various operations:

	s	*d*
Cost of lime shells at kiln, per ton	12	0
» slaking and covering with earth . .	0	5
» turning heap and slaking remaining lumps	0	5
» riddling through ½ inch riddle. . . .	0	10
Total cost per ton . . .	13	8
Cost of ground lime per ton at kiln.	18	—
Balance in favour of slaked, lime per ton . .	4	4

From the above table it will be seen that it is more advantageous to use slaked lime than ground lime. The slaked lime was made by pouring water on the burnt lime, at the rate of 20 gal-

lons per ton; the heap was then covered with a few inches of earth; about 12 hours later it was turned over, the unslaked lumps were slaked, and the lime riddled to free it from stones etc.

By this means the lime is obtained in a very fine dry powder which can be sown without difficulty by a manure sowing machine. The only drawback is that the lime must be applied immediately after the slaking has been completed, and that accordingly large quantities cannot be slaked at the same time. This however is but a slight difficulty.

DEMOLON, A. and BROUET, G. **On the Penetration of Soluble Fertilizers into the Soil.** (Sur la pénétration des engrais solubles dans les sols). — *Annales de la Science Agronomiqne*, 28 Année, No. 6, pp. 401-418 + dgr. II. Paris, Décembre 1911. **681**

France

One of the most important questions regarding the economy of the practical application of chemical fertilizers is the method in which it should be carried out. In other words, it is not yet known in what quantities, nor with what rapidity fertilizing substances pass into the subsoil, and how their dispersion thence, which results in economic loss, is to be avoided.

In fact, hitherto the question has been studied, especially at Rothamsted, only by means of direct analyses of the soil water, or by Th. Schloesing Sen. by means of displacement of the soil solutions. Diffusion phenomena require further investigation, although Müntz and Gaudechon have already drawn attention to their very slow action.

The writers, in order to render our knowledge complete as regards this last point in question, have conducted three series of experiments.

1. Laboratory experiments with sodium chloride on non-absorptive substance (sand washed in hydro-chloric acid). Diffusion took place very slowly, being clearly due to displacement.

2. Laboratory experiments with sodium chloride on an absorptive substance (loam): The clay hinders diffusion, probably by means of its absorptive property; but with the fineness of its particles, diffusion, which is also promoted by compression, increases.

3. Experiments with soil with nitrate of soda in the open ground.

a) In 1910, in spite of exceptional conditions favourable to washing down of nitrate of soda to the lower strata (sandy soil, great atmospheric precipitations) the transport and the elimination of this substance from the arable soil were rather slow: 246.4 mm.

of rain were not sufficient to remove entirely from the surface layer of 20 cm. the nitrate which had been applied as a top-dressing.

b) In 1911, 3/4 of the amount of the nitrate of soda applied as a top-dressing on April 12 after the winter rains, was recovered thirteen days later from the first 5 cm. of soil, which shows the slowness of its diffusion, even in light soils, in the absence of rain.

Watering acts in two different ways: in a rainy season, when the soil is sufficiently damp, it contributes by infiltration to the penetration of the nitrate into the deeper layers, but it is not at all the same when the soil has been dried by evaporation as the result of a fairly long rainless period; it then contributes to carrying again to the surface a certain quantity of the nitrate by means of an upward movement of the deeply seated water due to evaporation; this explains the formation of saline crusts which are to be observed sometimes as the result of rain following upon a period of drought.

As a result of these experiments, the writers deduce that in heavy soils, in normal years, there is no fear of the removal of the nitrate of soda during the vegetative period, and that its removal in loamy soils is less rapid than is supposed.

Therefore, it may be concluded that in practical agriculture, the method of application of chemical fertilizers must vary according to the nature of the soil and crops. In general, the heavier the soil is, and the longer the root-system of the plants under cultivation, the earlier it should be used.

Further, contrary to received opinion, in the case of loamy soils, the fertilizer should be applied twice, ploughed in during the winter, and later harrowed in before sowing. The fertilizers must be of a sufficiently fine consistency, so every farm should possess apparatus for pulverising the nitrate of soda and the potash salts just before use. A certain number of the complicated commercial fertilizers owe their practical superiority to the fineness of their particles due to the method of preparation. The application of salt fertilizers as top-dressing should be confined to sandy soils, and should be carried out some time before sowing. If the spring is abnormally wet, a second application is always possible, which, in the writer's opinion, is preferable to running the risk of the inconveniences which might arise as the result of a late application followed by a period of drought.

As regards heavy soils, nitrate of soda given late in the vegetative period will only have a very limited usefulness. No doubt want of labourers is often responsible for insufficient manuring, but

the principles laid down are of importance to every agriculturist, and if followed, would ensure real progress in the technique of soil fertilization.

Artificial Manures in Hungary. — Communicated by the Delegate of Hungary, Mr. de Miklós de Miklosvár. 632

In Hungary the consumption of artificial manures increases greatly every year, keeping pace with the growing improvement in agriculture. The *National Hungarian Agricultural Association* has, with the consent of the Government, opened a competition for the best works on the special importance of superphosphates in Hungary. **Hungary**

The following are the principal conditions of the competition:

The competitors are to present their works, marked with a motto, to the Committee of the Association, not later than the 1st of July 1912.

The work must consist of at least three sheets of printed matter. The jury appointed to examine the works will be formed by members delegated by the "National Hungarian Agricultural Association".

The two best works will be awarded prizes of 1000 and 500 crowns respectively (£ 41.13*s.* 4*d.* and £ 20.16*s.* 8*d.*), offered by the Association for the use of artificial manures. The first prize will be awarded only to a work of absolute merit.

The following questions must be dealt with:

1. The history of the manufacture of superphosphate and its consumption in Hungary.

2. The consumption of superphosphates in the Western countries compared with that in Hungary.

3. The increase of the various crops obtained in Hungary by the use of superphosphates.

4. The increase in the value of land caused by the increase in crops due to the use of superphosphates.

5. The effect of the use of superphosphates on the increase of national wealth, or the benefit to the country due to heavier crops.

6. Whether the use of superphosphates has had any influence — and if so, of what nature — on the development of railways; and whether the use of this artificial has had any effect on other industries.

7. What quantity of superphosphate the Hungarian agriculturist should use, so as to counteract the impoverishment of the

soil in phosphoric acid, that is, to attain, by giving the soil the necessary amount of phosphoric acid, an average increase of crops corresponding to the general higher cost of economic conditions.

8. Summary.

683 HIDOUX, J. **Results of Experiments with Potassic Fertilizers in Brittany**. (Les Engrais Potassiques en Bretagne). — *Journal d'Agriculture Pratique*, 76e Année, t. I, No. 6, pp. 172-173. Paris, 8 Février 1911.

France: Brittany

Although 48 % of the soil of Brittany is derived from schists, the idea that the greater part is formed by the weathering of volcanic rocks has led to the supposition that potassic fertilisers are not needed, though the use of unleached wood ashes has been much favoured.

Recent experiments made at the Station of Agricultural Chemistry at Rennes, show, however, that the supposed high potash content is a fallacy. The writer organised a series of practical experiments in the district of Lorient, adding to the usual phosphatic manures, 8 cwt. kainit, 2 cwt. sulphate of potash, 2 cwt. chloride of potash per acre of potatoes, mangels, peas, clover and cabbages. The manure was ploughed under. The results of these experiments show, that farmers should not dispense with potash manures which give in many cases greatly increased crops. Thus on soil derived from crystalline schists, the use of kainit caused an increase in the potato crop of 500 fr. per ha. (nearly £8 per acre). As a rule, the best results were obtained with the chloride, for the crop rose from 105-150 qls. per ha. (54-120 cwt. per acre) without potash, to 190-300 qls. per ha. (152-240 cwt. per acre).

The writer advises that large quantities of potash salts should not be used immediately, but that cultural experiments should be made, and potash manures applied to soils well provided with phosphoric acid and lime.

From the above-mentioned experiments, and from those made some years ago, and contrary to the opinions of other investigators, M. Hidoux considers that potash manures have shown themselves to be the most efficacious in the case of soils which are regularly treated with lime and phosphates, so that the phosphatic manures hitherto used must not be replaced by potash manures, as some agriculturist would be led to suppose; but on the contrary, both are necessary, and should be employed together.

The application should be made early, in December, especially when it is put on as a top dressing, as in the case of meadows;

for these kainit mixed with basic slag is recommended. For other crops, the chloride appears the best for soil regularly limed, and otherwise the sulphate. But these conclusions are not final.

FÖRSTER, B. **The Extent and Probable Output of the Potassic Deposits in Upper Alsace.** (Ergebnisse der Untersuchung von Bohrproben aus den seit 1904 im Gange befindlichen, zur Aufsuchung von Steinsalz und Kalisalzen ausgefuhrten Tiefbohrungen im Tertiär des Oberelsass. — *Mitt. Geolog. Landesanstalt Els.-Lothr.*, Bd. VII, H. 4, §§. 349-518 + 1 K.t 4 tf., + 3 Zchn. + 2 Tab. Strassburg i. E., 1911.), *Kali, Zeitschrift für Gewinnung, Verarbeitung und Verwertung der Kalisalze*, VI. J., H. 4, pp. 77-81. Halle a. S., 15. Februar 1912. 634

Germany: Alsace

The borings made by the Geological Service of Alsace show that the area of the deposition of potassic salts is bounded on the south by Reiningen, on the east by Cernay, on the north by Meienheim, and on the west by the Ensisheim-Mülhausen tramway; the depth diminishes in passing from north to south.

During the work of exploration, 120 borings were made, of which the most carefully examined is that of Wittelsheim I which reached a depth of 1119 m. (3670 ft.), and where potassium was found for the first time in Alsace. From the cores obtained, the sequence of the Tertiary deposits was as follows:

I. Blue marl, from 39 to 100 m. (128 to 328 ft.).

II. Variegated marl, from 100 to 440 m. (328 to 1443 ft.).

a) Gypsum.

b) Zone of fresh water.

c) Dolomitic anhydrous marl.

III. Variegated marls, saline formation properly so called, from 440 to 960.30 m. (1143 to 3149.7 ft.).

a) Upper bituminous zone, potassic deposit.

b) Zone of solid rock.

c) Lower bituminous zone.

d) Conglomerate.

IV. Green marl, from 960,30 to 1119 m. (3149.7 to 3670 ft.).

a) Dolomitic marl.

b) Calcareous marl.

With regard to the potassic deposits, we have first of all the upper stratum of sylvite with a medium actual thickness of 1.164 m. (3.72 ft.) which occurring over an area of 84 000 000 sq. m. (100 000 000 sq. yards) represents a total amount of 97 776 000 cub. m. (127 880 000 cub. yds.).

Then follows the lower stratum with a medium actual thickness of 3.507 m. (11.5 ft.) over an area of 172 000 000 sq. m. (205 700 000 sq. yds.), which makes a total amount of 603 204 000 sq. m. (789 000 000 cub. yds.). For the two strata an amount of 700 980 000 cub. m. (916 880 000 cub. yds.) can be reckoned. Taking as a basis of calculation 2.1 metric tons of useful mineral per cub. m. (1.6 Imperial ton per cub. yd.), we have a total of 1 472 058 000 metric tons; at 22 % of potash this leaves in round numbers 300 000 000 tons of pure substance as the whole deposit of sylvite in the Upper Alsatian basin of Wittelsheim.

Now, in 1909, for example, the total consumption of potash was 675 330,9 metric tons worth 144 956 647 fr. (£5 740 857.6s.), so that the value of the Wittelsheim potash deposit would be 65 000 000 000 fr. If the world's consumption per anmum remained at the above-mentioned figure, the Wittelsheim deposits would last for 493 years. Judging however from the increased demand for potash in Germany, it may be assumed that the annual consumption will still increase 10 % for 50 years, thus the Upper Alsatian reserve would only last 40 years but we must take into consideration that other supplies exist in North Germany. According to the German laws relating to potash (1), the Upper Alsatian deposits, like all the others in the German Empire, are required to be controlled by the Potash Syndicate and they therefore cannot enter into competition with those of Stassfurt. (2).

685 GOLTE, W. **Potassium Salts a Protection against Frost.** (Schutz durch Kalisalze gegen Frost). *Illustrierte Landwirtschaftliche Zeitung*; 32 Jahrg., Nr. 10, p. 77. Berlin, 3 Februar 1912.

Germany

Some experiments have been carried out by Dr. Golte with the object of showing how far potassium salts protect plants from frost. Of three rye plots, each a quarter of an acre in area, the second received no potassium, while to the first was applied 264 lbs of kainit, and to the third 132 lbs., as top dressings. It was then found that at a temperature of - 11° C. (+ 12° F.) the soil of the first and third plots remained unfrozen, in sharp contrast to that of the second. The moisture on the surface of the soil contained a considerable amount of salts in solution, and therefore did not freeze. The treated plants however did not look so well as those

(1) *Gesetz über den Absatz von Kalisalzen vom. 25 Mai 1910.* (*Ed.*).
(2) See also *L'Engrais*, 27e A., No. 6, p. 156. Lille, 9 Février 1912. (*Ed.*).

on the second plot. The leaves had the appearance of having had the water withdrawn from them by means of plasmolysis. But when the thaw set in, this pathologic aspect entirely disappeared, and the plants soon looked better than the others, and it is clear that the temporary withdrawal of water from the leaves did no lasting harm.

The injurious effect of frost is known to lie in the fact that the water contained in the intercellular spaces and in the cell sap lacerates the tissues in the alternate processes of freezing and melting.

Now as the kainit withdraws a considerable quantity of this water, the change in volume of the remainder takes place without doing serious harm.

AGRICULTURAL BOTANY.

CHEMISTRY AND PHYSIOLOGY OF PLANTS.

HUTCHINSON, H. B. and MILLER, N. H. J. (Lawes Agricultural Trust). **The Direct Assimilation of Inorganic and Organic Forms of Nitrogen by Higher Plants.** — *The Journal of Agricultural Science*, Vol. IV, Pt. 3, pp. 282 — 302 + Plate 1 + Tables 4. Cambridge, January 1912. **636**

It is now known that any nitrogenous compound applied to the soil will, sooner or later, under ordinary conditions, be converted into nitrates, and if it can be shown that from certain types of nitrogen compounds plants can directly obtain all the nitrogen they require, and that of such types some are more favourable than others, the results cannot fail to throw some light on the synthetical processes in plants. **England**

The conclusions so far reached may be summed up as follows:

According to Molisch, M. Schultz, Perciabosco and Rosso nitrites are assimilated by different plants when in sufficiently dilute solutions; further, plants supplied with nitrogen in potassium nitrite solutions or as ammonium salts, contain a distinctly higher percentage of nitrogen than plants grown with nitrate. Other inorganic compounds of nitrogen — amidosulphonic acid, hydroxylamine, hydrazine sulphate, and azoimide — have given negative results.

As regards organic compounds the majority have given negative, or at most uncertain results (1).

In the investigations described in this paper, as in the previous ones, the seeds were sterilised by a mercuric chloride solution under reduced pressure, and the plants (peas) were grown in Woulffe's bottles with the usual mineral substances in about 1 litre of water. The nitrogenous compound was added in such quantity as to supply about 80 mg. of nitrogen. The garden soil experiment gave no positive results.

It was found that the soil in the bottles had become infected and contained considerable amounts of ammonia.

The various compounds may be divided into the following groups, according to their availability, or otherwise, as direct sources of nitrogen for peas:

I. *Readily assimilated:* Ammonium salts; Formamide; Acetamide; Urea. Barbituric acid; Alloxan; Humus.

II. *Assimilated:* Glycine; α - Aminopropionic acid; Guanidine hydrochloride; Cyanuric acid; Oxamide; Peptone.

III. *Doubtful or not assimilated:* Hippuric acid; Trimethylamine; *para* - Urazine; Hexamethylenetetramine; Ethyl nitrate; Propionitrile; Hydroxylamine hydrochloride; Methyl carbonate.

IV. *Toxic:* Tetranitromethane.

The results so far obtained are not sufficiently numerous to make it possible to trace any connection between the assimilability or the reverse of the nitrogenous compounds and their constitution. Apart from humus, which, as a mixture, cannot be said to have a constitution, the best results were obtained with urea and barbituric acid, the former assimilating rather more nitrogen than the latter, whilst barbituric acid gave the greater amount of dry produce.

The similarity of the two results is probably due to the fact that barbituric acid is readily decomposed with production of urea and malonic acid.

The next best result was obtained with acetamide, which gave nearly as much dry produce as barbituric acid, although less nitrogen was assimilated. After acetamide the highest results as regards the amounts of nitrogen assimilated were those obtained with ammonium sulphate (without calcium carbonate), formamide, and alloxan, which assimilated 12.5, 8.5, and 7 mg. of nitrogen respecti-

(1) Cf. *B.* March 1912, No. 494. (*Ed.*).

vely. Glycine, alanine, and peptone come next with 5.8, 5.1 and 4.8 mg. of nitrogen. Then oxamide (3.6) and guanidine (2.7 mg. nitrogen), and lastly cyanuric acid.

The assimilation of nitrogen varied from a maximum of 33.7 (culture infected) for urea to a minimum of 1.3 for cyanuric acid + $Ca\,CO_3$. With humates the nitrogen assimilated amounted to only 5.9 mg.; the amount of dry produce was however comparatively high, being more than was obtained with urea.

The above grouping is only provisional, and it should be remembered that the ability of a plant to utilise the nitrogen of any particular compound depends not only on its power of detaching the nitrogen, but on the nature of the carbon compound or compounds remaining. A copious bibliography is annexed.

MOLLIARD, MARIN. **Is Humus a Direct Source of Carbon for the Higher Green Plants?** (L'humus est-il une source directe de carbone pour les plantes vertes supérieures?). — *Comptes Rendus de l'Académie des Sciences*. Tome 154. No. 5; pp. 291-294. Paris, 29 Janvier 1912. 637

France

After it was established that certain organic substances relatively simple, such as sugar, are absorbed by the higher plants, and form food-stuffs for them, the question was asked whether the same was not true for more complex substances and particularly for humus. Besides its theoretical interest, this question is of great practical importance,

The action of humus on plants through the nitrogenous and mineral substances contained in it has been proved in numerous works, but the carbon food of the plant as taken from the soil's humic matter *has not yet been demonstrated.*

In a first series of experiments with plants grown in sterilised earth, and protected from the carbonic acid in the air, the writer has shown the effect which humus may produce on plants by reason of its production of carbon dioxide. But the conclusion already reached is that, if humic substances are directly assimilated by green plants, yet the amount so absorbed is altogether insignificant.

BAGULEY, ALLAN. **The Phosphate Nutrition of Plantes.** *Journal of Agricultural Science*, Vol. IV, Pt. 3, pp. 313-322 + fig. 1. Cambridge, January 1912. 638

Great Britain
England

Much work has been done in America, on the Continent and in England, to determine the effect of different finely-ground, natu-

rally-occurring phosphatic substances on plants growing under different conditions. In a few cases results or conclusions appear to conflict.

Not nearly so much attention has been devoted to the effect of artificially prepared insoluble salts of phosphoric acid on the growth of plants, when these are employed in the absence of ammonium salts, and acid soil substances. Definite information should be obtained as to the powers possessed by plants of utilizing insoluble phosphates.

For this purpose, the writer made some pot cultures of peas, oats and swede turnips. The medium in which the plants were grown was chiefly made up of pure white sand; to this were added the different phosphates, and a nutrient solution. The phosphates used were ferric phosphate, aluminium phosphate, and calcium phosphate. Grown with calcium posphate, oats germinated and died; peas developed badly with few flowers and puny pods ripening early; the swedes commenced to grow about six weeks late, but developed normally.

Grown with ferric phosphate, oats made strong very well developed plants with dark foliage, and plenty of seed ripening late; peas made sturdy healthy plants with well-developed pods, not very numerous, ripening late; swedes grew steadily and well from the start. The results obtained with aluminium phosphate were much the same.

Compared with the superphosphate plants, the oats did not tiller so well as these latter, but they were in each case clearly stronger in the straw and longer in the ear, being finer plants altogether; the swedes were both larger and more healthy than with the superphosphate; the peas grown with ferric phosphate and with aluminium phosphate were neither so early nor so fruitful as when grown with superphosphate.

With calcium phosphate, the results were very different: the oat plants were very ill-developed and produced no ear at all; the swedes started badly, but at the end of the season, though late, were healthy plants; the peas grew moderatily well, but the plants ripened early and the crop was poor.

Subsequent experiments were carried out with the object of ascertaining the effect of ignition and extraction with boiling water on the availability of the precipitated phosphates. The results showed that:

1. Ignition and extraction with boiling water excercise a considerable effect on the availability of the phosphate.

2. That insoluble calcium phosphate is markedly less effective in the growth of oats than insoluble iron phosphate.

3. That this difference in efficiency is not apparent in the case of swedes and peas.

The results as a whole are in accord with the conclusions of Söderbaum (1) and Prianischnikoff, the former found that not much phosphoric acid is available for the oat plant, and the latter, that even in pure sand, lupins can use apatite, though Gramineae fail to do so.

Recent Chemical and Physiological Investigations on the Sugar Beet. 689

(The figures in brackets refer to the bibliography at the end of the artiele).

The formation of sugar in beets is a question in the chemistry and physiology of plants, of the greatest practical interest, from the study of which further improvements in the cultivation of beets are to be expected. On this subject several recent works have appeared. Austria

First of all Stift (1) as a result of some researches on the root rot of beets, of which he again states the origin and nature to be highly complex, confirms the opinions of Strohner, Briem and Fallada (2) as to the injurious action of shade on the root development of beets.

It thus seems an established fact that insufficient light causes a development of the leaves at the expense of that of the roots, with the further disadvantage of a lesser accumulation of sugar and of the production, from an industrial point of view, of an inferior crop.

Passing now to the internal phenomenon of the circulation of sugar in the beet plant; the results obtained by Ruhland in a series of investigations carried out in 1909-1911 at the Imperial Biological Institute for Agriculture and Forestry et Dahlem (3) acquire special importance. Germany

Circulation of sugar.

1. Sugar does not circulate as saccharose, as is generally believed, but as inverted sugar, probably as fructose, under this form reaching the root where it is condensed as saccharose.

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(1) See: SODERBAUM, H. O. *Meddelanden från Kungl. Landtbruks Akademiens Experimental fält*, 67, 1-15, — PRIANISCHNIKOFF, *D. Landw. Versuchs. Stat.*, LXIV, 23 et seq.; also this *Bulletin* June 1911, No. 1672. (*Ed.*).

2. In passing through the stem besides the inverted sugar, saccharose also occurs, but only the first reaches the root.

3. In the second period of vegetation sugar circulates in the root as saccharose and is split only on reaching the leaves.

4. Very probably in the floral shoots the ascending sap contains saccharose which is inverted only in the flower buds.

Permeability.

5. The cells of the leaves and stalks are permeable to raffinose, saccharose, maltose and in a greater or lesser degree to other sugars capable of forming starch, as well as to rhamnose and to glycerine, but not to other carbohydrates however diffusible they may be.

6. The permeability to saccharose and to inverted sugar, however, does not seem to be great. Glucose and fructose are diffused somewhat more easily.

7. While light has no sensible influence, the elimination of the products of assimilation appears constantly to modify the permeability.

8. The cells of the root have a lower degree of permeability to the above mentioned sugars than those of the leaves.

9. In opposition to older data, it appears now that exosmosis from the adult roots takes place especially for saccharose.

10. The cribrose ducts are not permeable to sugar like the other cells and therefore can have no part in the circulation of sugar.

Invertase.

11. Invertase in the beetroot is insoluble, and it is found constantly in every part of the plant, with the exception of the seeds and mature roots ;

12. In the young roots of seedlings invertase is present, but wlth the progress of growth it rapidly disappears, confining itself to the youngest parts, whilst neither in the mature root, nor even in its second period of vegetation, is any more invertase formed.

13. Invertase however may be formed in those roots which appear in consequencc of traumatic stimulus.

14. Invertase is not localised separately from saccharose.

15. Probably saccharose is inverted only after having penetrated into cellular plasm, no secretion of enzyme having been observed.

On the action of enzymes and the circulation of sugar in beetroots in general, some very singular observations have been recently made by Campbell (4) on the leaves produced on two plots of mangolds, one of which had been treated with a complete manure, and the other without potash. From these observations it appears that the want of potash prevents the action of enzymes, and consequently the migration of the hydrocarbons produced by assimilation. **United Kingdom**

A further contribution to our knowledge on the circulation of sugar in the beetroot as proposed by Ruhland, is given by a new series of researches made by Strohmer, Briem and Fallada (5), according to whom for the first time it is settled beyond any question that biennal seed-bearing beets can produce sugar in their assimilatory organs. This sugar can accumulate not only in the stems, but also in the roots and eventually in the new formations of the latter. **Austria**

The same authors confirm the fact, that saccharose is formed as such in the leaves; but, agreeing in this with Stephani (6), they believe, contrary to Ruhland and Gutzeit (7), that sugar is also conveyed under the form of saccharose. Anyhow the literature on the subject deserves notice.

In the selection of beets rich in sugar, some physiological correlations aquire a high value as guides. Thus for instance the connection between the weight of the roots and their sugar content. **Bohemia**

From this point of view some recent investigations of Andrlík, Bartos and Urban (8) are important. According to them it appears that:

1. The weight of the root in beets is a character subject to a fluctuating variability, that is, to Quételet-Galton's so called law of accidental causes.

2. The variability in the weight of the roots is considerably greater than that in the sugar content.

3. The variability in the weight of the roots is not the same for every group of descendants, and distinction must be made between a normal and an abnormal accumulation of nutritive substances.

4. For every individual of a given descendance a certain sugar content corresponds, within the limits of variability, to the weight, and viceversa; nevertheless to equal weights the same sugar content does not correspond, and viceversa.

5. Thus no general law of correlation exists, according to which the sugar content diminishes with the increase in weight of the roots; only in extreme cases, and not always, may such a law be

observed, though in such cases it is a phenomenon due to an abnormal nutrition of the beet.

Austria

It was of the greatest interest to verify in practice such important results. Consequently Novotny (9), after having examined laboratory registers containing the results of analyses carried out between 1892 and 1910, confirms the assumption that in consequence of the improved selection of beetroot seed, the size of the roots has with time lost all significance as a factor determining a lower sugar content.

The above researches may be summarised in the following:

CONCLUSIONS.

I. It may be considered as settled that a want of light is injurious to the beet crop, giving as it does a product of low industrial value.

II. Whilst it cannot be denied that sugar as saccharose is formed in the organs of assimilation of the beet, it is not equally certain that it circulates as such in its passage to the organs of reserve.

III. There is no doubt that beets in the second year of growth can produce and store sugar.

IV. In general the correlation between the decrease in sugar content and the increase of weight of root does not hold good.

V. With a perfect selection (élites) the injurious influence of root weight on sugar content can be eliminated.

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(2) STROHMER, F. (Ref.); BRIEM, H.; FALLADA, O. Einfluss der Belichtung auf die Zusammensetzung der Zuckerrübe. *Ibid.*, 1. H., pp. 11-28.

(3) RUHLAND, W. Die Wanderung und Speicherung des Zuckers in der Zuckerrübenpflanze. *Zeitschrfit des Vereins der Deutschen Zucker-Industrie*, 672. Lf., pp. 1-19. Berlin, Januar 1912.

(4) CAMPBELL, A. V. Carbohydrates of the Mangold Leaf. *The Journal of Agicultural Science*, Vol. IV., Pt. 3, pp. 248-259 gr. III. Cambridge, January, 1912.

(5) STROHMER, F. (Ref.); BRIEM, H., FALLADA, O. Zur Kenntnis der Saccharosebildung in der Zuckerrübe. *Osterr.-Ung. Zeitschr.* etc., 6. H., pp. 857-866.

(6) See *B.*, Nov.-Dec. 1911, No. 3148.

(7) GUTZEIT, E. Monströse Runkelrüben und Wanderung resp. Speicherung des Rohrzuckers. *Naturwissenschaftliche Zeitschrift für Forst-und Landwirtschaft*, 9. J., 11. H., pp. 481-507 + fgg. 3. Stuttgart, November, 1911.
(8) ANDRLIK, K.; BARTOS, V.; URBAN, J. Über die Variabilität des Gewichtes und des Zuckergehaltes der Zuckerrübenwurzeln und über die gegenseitigen Beziehungen dieser beiden Merkmale. *Zeitschrift für Zuckerindustrie in Böhmen*, J. XXXVI., H. 4, pp. 193-210 + fgg. 4. Prag. Jänner 1912.
(9) NOVOTNY, K. Ein Beitrag zu Betrachtungen über die Beziehungen zwischen dem percentuellen Zuckergehalte und dem Gewichte der Rüben. *Ibid.*, pp. 269-272. Febr., 1912.

Composition of Hay: Influence of Time of Cuting. — See below No. 653. **640 United Kingdom: England**

KÖVESSI, FRANÇOIS. **Effect of Continuous Electrical Currents on the Development of Plants.** (Influence de l'électricité à courant continu sur le développement des plantes). — *Comptes Rendus de l'Acad. des Sc.* T. 154, No. 5, pp. 289-291. Paris, 29 Janvier 1912. **641**

Since 1907 the author has been carrying out investigations, in the open, on the influence of electricity on the germination of seeds and on the successive development of herbaceous and woody, agricultural and forest plants. **France**

The greater part of his work has been devoted to wheat (*Triticum sativum*) the speedy germination and development of this plant rendering it very suitable for methodical and precise research on the above mentioned phenomena. The results obtained have been verified by the Author and generalized by experiments made with other plants, both herbaceous and woody, such as: *Secale cereale, Avena sativa, Hordeum distichum, Vicia sativa, V. Faba, Stellaria media*, various meadow grasses, *Abies alba, Picea excelsa, Pinus sylvestris, P. nigra, Larix europaea, Robinia Pseudacacia, Betula verrucosa, Tilia parvifolia, Fraxinus excelsior, Quercus pedunculata;* and on some cryptogams, such as mosses, several species of algae and of fungi.

The action of continuous currents of electricity is, according to the author, decidedly injurious to the germination of seeds and to the development of plants.

Electricity, even in the corresponding points of experiments carried out in the same way, acts differently under varying conditions.

Not only are results modified by the principal conditions of electricity (potential, intensity etc.) but also by the secondary ones. Thus for instance sometimes even in the vicinity of the electrodes, the effect of electricity may be scarcely suspected; whilst other times on the contrary, all the space comprised between the electrodes becomes sterile.

The factors which play different parts in the complicated effects of electricity appear to be the following:

1. The physical properties of electricity; the potential and the intensity of the current; the conductibility of the medium in which the plant develops; the form, size and distance apart of the electrodes; the relative position of the plant or of a part of the plant and the electrodes; the density of electricity, the time during which it acts, etc.

2. The phys cal and biological factors which influence the life of the plant: heat, moisture of the soil and of the air, light, and the physical conditions of the nutrition of the plant. Heat and moisture act not only by the modification of biological conditions, but by the changes they cause in the conductivity and in other electro-physical factors of the medium in which the plant grows.

3. The chemical substances which furnish the plant food and form the medium in which the plant lives play a part in electrical conductivity, or in the location of the lines of electrical action.

4. The chemical bodies which are formed by electrolytical decomposition accumulate in the vicinity of the electrodes, and modify the physical, chemical and biological medium of the plant.

642 United States **Honey Bees and Pollinisation.** — See below No. 697.

SELECTION.

643 BIRGER, KAJANUS. **Mendelian Studies on Mangels and Turnips.** (Mendelistische Studien an Rüben). — *Fühlings Landwirtschaftliche Zeitung*, 61. Jahrgang, 4. Heft, pp. 142-199. Stuttgart, 15. Februar 1912.

Sweden

This is an interesting study on Mendelian heredity in root-crops, and the conclusions are based on the observations and experiments made by the writer at the Seed Producing Station of Weibullsholm in Sweden.

Mangels. — In crossing an oval mangel (Demi-sucrière) with a cylindrical one (Eckendorfer), oval forms occur in F_1 (the first hybrid generation). In F_2, offspring of two kinds are found, those with pointed, and those with blunt bases. On crossing Intermediate with Eckendorfer, out of 519 F_2 beets, 382 were pointed and 137 blunt; while theoretically, there should have been respectively 389 and 130.

The character of pointed base is dominant to that of blunt base. The oval beet has a determinant for the pointed form which is wanting in the cylindrincal beet.

On crossing a cuneiform sugar-beet with an Eckendorfer, the hybrids of F_1 are cuneiform, those of F_2 again show the pointed and blunt forms, but in the proportion 15 : 1. This separation shows the presence of two determinants for the pointed base in the sugar-beet. The schematic proportion of the separation of the forms where these are two pairs of characters is 9 : 3 : 3 : 1 ; thus 9/16 of the descendants possess the two dominant characters, 3/16 one, and 3/16 the other, while 1/16 show neither. The proportion 15 : 1 which occured in the case under investigation, coincides exactly with that which could be foreseen theoretically.

Two hybridization experiments illustrative of the character " length " were carried out. On crossing elongated Barres with nearly round Yellow Globe, oval hybrids occurred in F_1, while in the second and succeeding generations (F_2-n) the longish and round hybrids occurred in the proportion 3 : 1. The oval shape is due to a determinant which is not present in the round mangel.

There are, however, mangels with two determinants for the character of " length ". Thus; in crossing Mammoth (a very elongated type) with Tannenkrüger, the F_1 hybrids are fairly long, and in the successive generations the offspring are divided into three groups: long, oval, nearly round. The latter occur in the proportion of 1/16, in complete accordance with the ratio 9 : 3 : 3 : 1. How then is the origin of the almost round beet to be accounted for? The parents differ in that the one possesses two determinants for character " length ", and the other only one. Why therefore is the proportion in the offspring not 3 : 1 as would have been expected from the crossing of two kinds containing a different factor?

This proportion would have been retained if the parents had been homozygotes, that is to say derived from parents which each possessed the determinant for the character of " length ". But one of the varieties of mangel was without doubt heterozygote, *i.e.* the result of the fusion of two differing germ-cells and therefore not belonging to a pure race.

Denoting the presence of the two determinants of length by L_1 and L_2, and their absence by l_1 and l_2 respectively and allowing that the Tannenkrüger are homozygotes as regards L_1, and the Mammoths as regards the same character, we have Tannenkrüger = $L_1\ L_1\ l_2\ l_2$ and Mammoth = $L_1\ l_1\ L_2\ l_2$.

In the first case the male and female gametes are always $L_1\ l_2$, while in the second case, two different types occur, *viz.* $L_1\ L_2$ and $l_1\ L_2$. On reuniting $L_1\ l_2$ with $l_1\ L_2$, we obtain offspring which possesses two pairs of characters, which should group themselves in F_1 in such a manner as to divide in the second generation into elongated and shortened forms in the proportion of 15 : 1.

In crossing two elongated types, it is possible also to obtain in F_1 round beets even where one of the parents is a heterozygote as far as the character " length " is concerned. On the other hand, from the cross of two elongated types there may occur in F_2 " new " long types.

Thus Golden Tankard $\times$ Barres gives rise in F_1 to long forms and in F_2, in addition to these, to some forms which are nearly round and to others oval in shape. The presence of nearly round and of oval forms is explained by the presence of two different determinants for the character " length ".

That is to say, if the length of one beet is caused by L_1 and the other by L_2, in F_1, some of the offspring have both pairs of factors; in some, one factor is missing, (these are the long roots); while in others, none of the " length " factors are present ; these are the round roots.

Thus from all that has been said, it is clear that beets have, at least, four different form determinants, two of which affect the shape of the base and two the length. These determinants are independent of one another, and can exist alone, or in combination.

The question of colour-inheritance among mangels is, however, far more complicated and seems to depend on a large number of factors of which some on union give rise to a certain colour, some mask this colour, while others intensify an existing shade. The F_1 roots are red, not only when their parents are red, but also when the latter are respectively red and pink, red and yellow, red and white, pink and white and also both white.

Further, the offspring of isolated red beets can be:

Red, pink, yellow and white.

Red, pink and yellow.

Red, pink and white.

Red, yellow and white.

Red and pink.

Red and yellow.

Red and white.

Yellow Globe × Barres (Yellow types) gives in F_1, all yellow hybrids; in F_2, most of the offspring are yellow, but there are a few red, the ratio, counting by groups, being 15 : 1.

Thus in the above cross, which included 75 beets, there were 69 yellow and 6 red, which corresponds with the figures theoretically expected, 70 and 5.

How is this segregation of characters to be explained. From the ratio 15 : 1, as has already been mentioned, we see that we have to do with two different factors G_1 and G_2; their absence may be represented by g_1 and g_2.

Schematically the matter can be expressed as follows:

$$\begin{array}{ccccccc} G_1\,G_2 & & G_1\,g_2 & & g_1\,G_2 & & g_1\,g_2 \\ 9 & : & 3 & : & 3 & : & 1 \end{array}$$

1/16 of the offspring were red.

Thus there are in this case two factors which alone, or combined give the same result—yellow.

Turnips. — In turnips also there are two "length" factors. On crossing Bortfelder (an oval form) with Centenary (which is nearly round) the F_1 hybrids are oval and the succeeding generations contain oval and nearly round roots in the proportion 15 : 1.

Representing the "length" factors by L_1 and L_2 and their absence by l_1 and l_2. a pure Bortfelder has the composition ($L_1\,L_1\,L_2\,L_2$) and a pure Centenary ($l_1\,l_1\,l_2\,l_2$). The gametes of the former have a constitution of $L_1\,L_2$ and those of the latter, $l_1\,l_2$.

In F_1, the hybrids have the composition $L_1\,l_1\,L_2\,l_2$, from which four types of gametes can be derived:

$L_1\,L_2$ (2 "length" factors)
$L_1\,l_2$ (1 length factor)
$l_1\,L_2$ (» »)
$l_1\,l_2$ (no » »)

These four gametes can combine in 16 ways, one of these is ($L_1\,L_1\,L_2\,L_2$), another is ($l_1\,l_1\,l_2\,l_2$); all the other combinations contain L and l. Thus only 1/16 of the offspring are nearly round, repeating the ratio 15 : 1 already present in the analogous preceding cases.

With regard to colour, two portions must be distinguished, the top, which is purple, green, or yellow, and the base, which is yellow or white. In the upper part, according to the writer, green is dominant to yellow and in the lower portion, white is dominant to yellow. When Bortfelder, yellow-top, is crossed with Centenary

green-top, in F_1 the proportion of green to yellow tops is 3 : 1. In one case, of 403 turnips in the second generation, 308 were green and 95 yellow; theoretically there should have been 302 and 101; the approximation is therefore quite satisfactory.

White Tankard Purple-top, with purple top and white flesh and base, crossed with Bortfelder, with yellow top and flesh, gives in F_1 exclusively turnips with purple tops and white flesh. On the other hand, in F_{2}-n there are four different types as regards "colour" character. Out of 412 turnips of F_2, there were: 229 with purple tops and white flesh; 98 with yellow tops and white flesh, 68 with purple tops and yellow flesh, and 17 with yellow tops and flesh. According to theory, segregation takes place into two independant characters; the groups in question would contain theoretically 232, 77, 77 and 26 turnips.

Kohl-rabi. — In kohl-rabi the writer only considers the colour of the top, which may be: dark reddish-purple, light reddish-purple, and green. When it is the first, the neck is of the same colour, but when the top is red-green the neck is usually green.

In this case, there are two different factors for red, one of which gives a dark shade, and the other a lighter; if both are wanting, the top is green.

"Gelbe Schwedische" (with green top), crossed with "Magnum Bonum" (reddish-purple) gives in F_1 only reddish-purple hybrids. The F_2 contains three types: thus out of 4308 specimens, 3472 were reddish-purple, 728 red-green and 108 green, which makes the proportion 12 : 3 : 1. This ratio shows the presence of two determinants for red; a dark red factor and a light-red, of which the first is dominant to the second.

Thus those kohl-rabi having the two factors (9/16) are indistinguishable from those (3/16) which have only the dark red factor: therefore in a group of 16 kohl-rabi, 12 will be of a similar red.

In conclusion, it seems that the cultivated varieties of mangels and turnips are excellent material for the study and application of Mendel's laws.

644 BLARINGHEM, L. **The Present Position of the Mutation Theory.** (L'état present de la théorie de la mutation). — *Bulletin de la Société botanique de France*, T. LVIII, 1911, pp. 644-652. Paris, Février 1912.

France

One may define a mutation in a pure and homogeneous strain as the sudden appearance of one or more individuals or buds possessing new characters capable of passing on unchanged by means

of sexual reproduction. According to De Vries, mutations are quite distinct from fluctuations, which are habitual variations of the characters of a species about a mean. Fluctuations affect characters already possessed by the species, while mutations involve loss or acquisition of characters. Mutations are thus hereditary alterations of a definite nature, whose existence can be recognized by growing pure strains.

Johannsen (1) has been able to observe four definite mutations during ten years' cultivation of French beans Two of these were bud variations (bud white and completely devoid of chlorophyll, and bud with yellowish leaves); the other two affected the shape (elongated) of the seed.

Since 1895 De Vries has been studying *Oenothera Lamarckiana*, which has given 3 % of mutants belonging to about ten different types, mostly stable.

Zeijlistra (2) has found that the stunted shoots of *Oenothera nanella* (one of the mutants of *O. Lamarckiana*) contain cells full of the zooglaea of *Micrococcus*; but as the disease (if so it may be called) is completely hereditary, this explanation does not affect De Vries' conclusions.

D. F. Mac Dougal (3) has studied the modifications produced in pure lines of *Oenothera biennis* and *Raimannia odorata* by the injection of solutions into the young ovary within twenty-four hours of fertilization; he used 10 % sugar, 1 % zinc sulphate, and 1 % calcium nitrate. Since 1906, pure lines of *Eschscholtzia*, *Argemone*, *Physalis*, *Anemone*, *Pentstemon*, *Nicotiana*, and *Echinocerus* and numerous other cacti have been treated in the same way. The results of all these seem to show that hereditary changes can be provoked by artificial means.

Similar experiments were carried out by Klebs who produced modification in the descendants in the case of *Sempervivum*. L. Blaringhem has produced most of the same modifications by the direct action of mutilations; he has also studied the action of traumatism in this connection (4).

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(1) " Ueber Knospenmutationen bei *Phaseolus* ": *Zeitschrift für ind. Abstammungs- und Vererbungslehre*, I, 1910, pp. 1-10; and communication to the 4th. International Conference of Genetics, Sept. 19, 1911.

(2) " *Oenothera nanella* de Vries, eine krankhafte Pflanzenart ": *Biolog. Centralbl.*, T. XXXI, 1911, pp. 129-138.

(3) " Alterations in Heredity induced by Ovarial Treatments ": *Botanical Gazette*, Vol. LI, 1911, pp. 241-257.

(4) *Mutations et traumatismes*, 1907, pp. 131-133; *Modifications brusques*, 1911, pp. 297-318.

According to L. Blaringhem, animal and vegetable parasites may also produce similar modifications and give rise to mutations.

R. R. Gates in America, J. M. Geerts in Holland, and B. M. Davis in England, have ascertained that the nuclei of the sexual cells in *Oenothera Lamarckiana* contain 7 chromosomes, while in *O. gigas*, one of De Vries' mutants, the number is 14. Since 7 is the usual number in *Oenothera*, *O. gigas* may be said to have the same relation to the other species as *Paris* (12 chromosomes) to *Trillium* (6), and *Nymphaea alba* (32) to *Nuphar luteum* (16).

It has recently been suggested (1) that some mutations may have a connection with the probable apogamy of certain mutants, but the facts on which this hypothesis is based require further study.

" To sum up ", says M. Blaringhem, " the theory of mutation remains intact as regards experimental data, and is further supported by new discoveries ".

645
Italy

Systematic Selection of Seed Wheat and of Clover Seed at the Vegni Agricultural Institute, Prov. of Arezzo, Italy. See below No. 705.

646

JONES, T. **Selection of Seed Maize.** — *The Queensland Agricultural Journal*, Vol. XXVIII, Pt. 1, p. 20, Brisbane, January 1912.

Australia: Queensland

Maize seed should be selected while on the stalks in the field, because it is then that the size and length of shanks, the height of the cob on the stalk, and the general health of the plant, can be observed.

It is not always wise to select the largest cob for seed, because very large cobs mostly owe their size to exceptional conditions during growth, and are therefore not likely to transmit it. Neither should cobs be chosen that stand too upright on the stalks, because such cobs readily take in rain, which causes shoots to grow out from the ends of the cobs.

The best cobs are those which are not too high on the stalks and the shanks should be slightly bent.

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(1) R. R. GATES, " Apogamy in *Oenothera* ": *Science*, N. S. 1909, Vol. XXX. pp. 691-694. MRS. R. H. THOMAS, " Various Crossing Experiments ": Communication to the Congress of Genetics at Paris, Sept. 20, 1911.

It is essential that the stalks should be strong and healthy at the early stage of growth, in order to support the cobs; otherwise the crop may be knocked down by rain and wind. Also the husks should extend well over the points of the cobs, which are thus protected from the cotton boll worm and from storms.

The time to select the seed is when some of the cobs are ripe, some ripening, and some green. At such stages it is easy to determine the early, medium, and late maturing varieties.

Great care should be taken in the thrashing of the seed; to prevent any possible cracking of the grain hand thrashing is desirable. The ends of the cobs should be discarded, the grains being smaller. The seeds must be selected from the centre of the cobs in order to ensure their being of uniform strength. Uniform strength in seed means a uniform crop.

COLLINS, G. N. and KEMPTON, J. H. **An Improved Method of Artificial Pollination in Corn.** — *U. S Dept. of Agriculture, Bureau of Plant Industry. Circular* No. 89, pp. 3-7. 647

United States

All the methods hitherto adopted for making self-pollinations in corn have the drawback of leaving the silks exposed for a short time to any pollen that may be floating in the air.

The new method here proposed eliminates this danger and is especially useful both in practical selection and in scientific research connected with problems in heredity. It has the further advantage of being inexpensive and easy to apply. It involves the use of strong paper tubes about 4 inches in diameter and 40 inches long. To apply the tubes, one end is pushed over the tassel which is carefully bent downwards and wired firmly at a point just below the upper end of the last leaf sheath. The other end of the tube is then brought down and passed over the young ear and securely wired. In order to provide for the increasing size of the ear a coiled wire is used, instead of a straight wire, to fasten the tube to the ear. The tubes should be put in place four or five days before the silks are expected to appear.

While this method can be generally applied to ears that are to be self-pollinated, it works equally well for artificially crossing two plants that are adjacent in the same or neighbouring rows. In testing Mendelian ratios it will be found convenient to arrange the planting with the hybrids between the parents. It will thus be possible to apply the method to self-pollinations and crosses between the hybrid and the parents.

648 LEAKE, H. M. and PRASAD, RAM. **Notes on the Incidence and Effect of Sterility and of Cross-Fertilisation in the Indian Cottons.** — *Memoirs of the Department of Agriculture in India: Botanical Series*, Vol. IV, No. 3, pp. 37-72. Calcutta, January 1912.

British India

The methods which can be adopted to procure improvement in a particular crop have been classified by Cook (1), and in the choice of method the experimentor should be largely guided by two considerations: 1) the extent to which cross-fertilisation takes place under normal field conditions; and 2) the degree of sterility which may result in plants subjected to artificial self-fertilisation carried out through a series of generations.

The work of improvement falls into two sections: 1) the production of an improved type, or types in a state of purity; 2) the multiplication of these types when established, until a stage is reached when distribution may be attempted. On the extent to which natural cross-fertilisation is found to occur, will depend the precautionary measures to be adopted in order to prevent a gradual deterioration of the crop.

The series of experiments made at the Agricultural Research Institute, Pusa, with the object of producing an improved cotton suited to the conditions of the United Provinces, has led to the two following general conclusions.

1. A considerable degree of sterility results from self-fertilisation repeated through a number of successive generations.

2. Cross-fertilisation takes place to a considerable extent, though the greater portion of this is limited to neighbouring plants.

The practical bearing of these considerations is of some importance. In the early stages of experimental work, when individual plants are under examination, it is necessary to guard against the effects of cross-fertilisation by protecting the flowers. By so doing, however, the danger is incurred of the loss of vigour, and even of the loss of the race through sterility. It is advisable therefore to rely for purity on careful selection, combined with roguing, among such plants as are least likely to have been crossed. For this purpose the types should be grown in numbers sufficient to give a fair body of individuals separated by at least 10 ft. and by intervening plants from individuals of a different type.

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(1) See U. S. Dept. of Agr., Bur. of Plant Industry, *Bull.* 146.

A further method — the efficiency of which still remains to be proved — consists in enclosing by a single net a set of 40-50 plants of one type.

It is well known that the cotton crops in India as well as in China, Persia, and America are as a rule not pure, but consist of a number of forms and in certain cases, of different types. Such a mixed crop will, under certain constant conditions, maintain a definite proportion between the various constituents. On the other hand new conditions will favour one or other of the component types, which will, in a short time, become the dominant element of the crop.

In this connection we should remember the frequent instances of the conversion of red to white wheat and of bearded to beardless, as the result of " degeneration " consequent on change of environment. Now if such cases are possible with wheats, in which cross-fertilisation is of the rarest occurrence, the danger of this " degeneration " in cotton, in which cross-fertilisation must also be considered, is much greater.

From very early times repeated efforts have been made to acclimatise various exotic cottons in India, but with little success. The crop at first maintains its standard, and subsequently undergoes a more or less rapid degeneration. The similarity between this and the cases of " degeneration " in wheat in striking, and suggests the possibility of a like cause. A less desirable type, which has not been completely eliminated, may acquire under new conditions of climate, a less careful cultivation, and cessation of roguing, a preponderance over the other forms.

In America excellent varieties have been obtained by means of a careful system of selection; but in order to keep them the indispensable conditions are a continuous and judicious roguing and the highly developed processes of cultivation belonging to the American cotton field.

The process of acclimatization has consequently been marked in most cases by a deterioration which has often been attributed to a degeneratian of the race, but it is more probably simply the self-assertion of those impurities which are best siuted to the new environment. The problem of the introduction of exotic races consequently assumes a new aspect. The larger the original importation of seed, the less would appear to be the chance of successful introduction, owing to the greater difficulty in the control of this process of displacement of one form by another. Before introducing an exotic variety it should be subjected to a most careful control, and a comparatively small importation is all that is at

first necessary. The aim should be to eliminate the less desirable forms, which under Indian conditions might become dominating, and form a new equilibrium suited to the new surroundings.

In all experiments made for obtaining the "improved type", the dangers of sterility and of cross-fertilisation should never be lost sight of.

649 PFENNINGER J. **How New and Valuable Varieties of Fruit may Arise.** (Wie neue wertvolle Obstsorten entstehen können). — *Der Schweizerische Obstbauer*, XIV Jahrg., Nr. 2, pp. 33-35. Münsingen, Februar, 1912.

Switzerland

It seldom happens that fruit trees, when ungrafted, yield fruit such as to be worth reproducing. But an interesting exception is recorded by Mr. Pfenninger. A wild apple tree, about 20 years old, without any previous pruning or grafting, suddenly began to yield very fine apples of excellent quality. This « variety » was then grafted on other wild apple trees, and soon began to be known for its beauty of appearance and choice quality under the name of the « Stäfner Rosenapfel ».

Apart from the purely scientific interest attaching to it as illustrating the « Spontaneous variations » of Darwin, or the « Minor mutations » of De Vries, this case is a remarkable instance of how out of a wild apple tree a new variety, now much valued in commerce, was evolved.

650 KOBRANOFF, H. P. **On the Production of Seed for Forest Trees.** (Is Oblasti Liesnogo Siemenoviedieniia). — *Liesnoi Xurnal* (Forest Review), G. XLI, Vep. 9-10, pp. 1373-1403. S. Peterburg, 1911.

Russia

It is well known that the germinating power of the seeds of forest trees may vary, under ordinary conditions, within very wide limits, for different lots of seed taken from a single species, and even from the same tree.

This was hitherto supposed to depend on errors in experiments and on the difference in the methods employed. But the recent researches of Baur have shown that this view is entirely mistaken, as will be seen from the following table:

Method adopted in the experiments	Germination began after:	Germination capacity
In pots with earth	10 days	88.0 %
Felt germinator	7 »	91.5 %
With the Nobbe apparatus . . .	7 »	94.0 %
» » Liebenberg » . . .	7 »	93.0 %
» » Hanneman » . . .	9 »	90.0 %

The effect of different methods or of apparatus being excluded, how are we to explain the varying germinating power of seed lots having the same origin?

The cultivators and producers of seed follow in each case the empirical method of calculating in every lot the percentage of germinating seeds, without considering their qualities and specific properties.

Now in most cases the seeds of forest trees may be divided into the following groups:

A. Developed normally:
- (*a*) those germinating.
- (*b*) those which have lost the power of germinating.

B. Empty seeds developed parthenocarpically.

C. Seeds damaged . . .
- (*a*) externally.
- (*b*) internally.

Hence, as the proportion between the different groups varies even for the same plant in each lot, the percentage of germinating power has such a relative value that the results of the different examinations cannot be compared. In this connection should be considered the absolute power of germinating. By "absolute power of germinating" is understood the percentage of seed that has germinated and which belongs only to group *A*.

In practice great importance is attached to the *percentage of utilizable* seeds: that is, the percentage of seeds that have germinated on the amount of non-selected seeds. This is indicated by the formula $\frac{R \times Kz \times Ke}{10\,000}$, where R = the pureness expressed in percentage of weight; Kz = percentage of germinating seeds; and Ke = percentage of seed germinating within a fixed time on the total amount of germinating seeds. The value of this percentage of utilizable seeds is absolute only when there is a direct proportion between the number and weight of the seeds. Otherwise it gives us only approximate conclusions within very wide limits.

From what has been said two points are clear:

1. The necessity of determining the absolute power of germinating.

2. The usefulness of estimating in practice the percentage of utilizable seeds; this gives the value of a lot as material for cultivation.

The question of the yield of forest trees in good seed has acquired greater importance now that the method of artificial forest regeneration is gaining more and more ground.

The number of fruits can not give an exact idea of the value of the yield. The empirical determination of the percentage of empty seeds, if it is sufficient in practice, is certainly unsatisfactory for the man who is looking for the cause of an increased or diminished yield.

For this purpose it is necessary to determine the *energy of fructification:* that is, the percentage ratio between the number of flowers and the number of seeds, normally developed and capable of germinating.

Under equal conditions of the surroundings in all the stages of the development of the seed, the energy of fructification shows how far the conditions themselves approached the optimum. This method besides supplying very exact figures for estimating the yield, also allows the data obtained in successive years to be compared, and clearly brings out the causes which affect the formation of the seed.

The following conclusions may be drawn:

1. Very exact methods should be used in determining the productiveness and germinating power of the seeds.

2. The determination of productiveness and of energy of fructification should be made in surroundings, either identical or comparable, and a register should be kept of the conditions of increase and of the appearance of causal factors that may influence the yield.

CEREAL AND PULSE CROPS.

651 KOSUTANY, DR. THOMAS. **The Excellent Quality of Hungarian Wheat** (1). — *Közletek.* Budapest, 7 février 1912.

Hungary

It has been stated that deep ploughing, the use of steam ploughs and especially the increased consumption of artificial manures have caused a softening of the Hungarian wheat, which is said

(1) See *B.* Feb. 1912, Nos. 325-326. *Kisérletügyi Közlemények*, Budapest 1906. — *Ungarische Mehl und Weizen* von Dr F. KOSUTANY. — *Der Müller*, Amtliches Organ des Verbandes deutscher Müller, 18. Sept. 1908. — Dr A. MAURIZIO. *Getreide, Mehl u. Brot. Das Getreidekorn, seine Bewertung u. Behandlung in der Praxis* etc. von Dr G. F. HOFFMANN, Prof. am Institut für Gärungs-Gewerbe in Berlin. I. Bd.: *Die Bewertung des Getreides.*

to be inferior to what it was when the crops were less abundant. Its alleged former hardness is attributed to the old fashioned peasant cultivation.

The author, on the strength of his chemical investigations, was almost alone in impugning these affirmations. He attributes the inferior quality of the last years' wheat to unfavourable climatic conditions.

With the object of calming the apprehension of agriculturists in so interesting a question, it was decided that every year 50 typical samples of wheat of the various provinces should be collected and examined chemically by M. Kosutány.

The author accomplished his task with the greatest care and already in 1906 he was in a position to declare positively in the *Kisérletügyi Közlemények* that the quality of Hungarian wheat had not changed nor deteriorated, that the more intensive culture had not impaired its hardness, and lastly that the judicious use of artificials had not only increased the yield of wheat but also improved its quality, provided always that the weather be favourable.

As a proof that Hungarian wheat has not degenerated, the author mentions the 1911 wheats supplied by six different localities in Hungary which weighed up to 850 gr. per litre (68 lb. 2 oz. per bushel).

According to M. Kosutány the Bánát or Tisza wheat, as almost all Hungarian wheat, is an autumn wheat. It is typical of the wheat grown in the plains (Steppenweizen). It is classed in the species *Triticum vulgare*, but both by its form and its quality it is very closely allied to hard wheat (*Triticum durum*). The grain is hard, red with a shade of brown or grey or even yellow according to the weather and to local circumstances. It is somewhat below average size, often angular and elongated. The yellower the wheat the less hard it is. This wheat contains much gluten, it bakes well, and may be considered as one of the best kinds of wheat. Nevertheless it is said not to be resistant to cold and to be a spring wheat (1).

The grain of Hungarian wheat is smaller and richer in protein than the wheat of Western Europe: 15.4 % on average of the dry matter, according to the analyses of M. Kosutány; the average weight of 1000 grains is 32.6 grams, the maximum 43.2 grams (1.14 and 1.51 oz. respectively).

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(1) See *Das Getreidekorn, seine Bewertung u. Behandlung*, von Dr. G. F. HOFFMANN, pp. 110-115. (*Ed.*).

According to M. Kosutány, Hungarian millers do not like spring wheat, probably because it may be considered as a hard wheat.

The Budapest Exchange of agricultural produce has adopted the following regulations respecting wheat: It is not to be exported if it contains: more than 2 % in weight of smutty wheat, of vetches, darnel, or in general other seeds; more than 0.5 % of one grained spelt, of hard or of white wheat; and lastly more than 1 % of sprouted grains.

Owing to the high esteem in which real Hungarian wheat is held it has become customary to give this name also to foreign wheats sent to Hungary thence to be exported to the North and to the West.

The opinion of Hoffmann that Hungarian wheat does not stand cold is not borne out. On the contrary the author is convinced that Hungarian wheat stands the winter better than any other foreign wheat.

The author, having thus by his careful researches extending over a period of 12 years, completely rehabilited Hungarian wheat, concludes that it is necessary now to preserve its high repute, and with this object in view he deprecates the importation of foreign wheat seeds esteemed for their high yields, because, though sometimes they give heavy crops under the extreme climate of Hungary, they often fail and damage the reputation of Hungarian wheat and flour.

ROOT CROPS.

652 EREMIEEVA, FU. **Injury to Root Plants by Frost.** (Vliianie Reannikh Samoroskov na Korneplodi), — *Juseno-Russkaia Seksko-Khosiaistvennaia Gaseta* (Journal of South Russian Agriculture), G. 1911, No. 48, pp. 48-49. Kharkov, 22 Dekabria 1911.

This paper describes the injury done by frost to potatoes and mangels in South Russia.

Russia

The heavy rains of September prevented the potato crop being lifted till towards the middle of October. On October 3rd and 4th there were severe frosts early in the morning, and all the root plants suffered more or less, and especially the late potato variety « Voltmann ». It was found that the action of the frost passed along the stems and penetrated to the tubers still connected with them;

whereas those free in the soil, even when near the surface, were unhurt.

The author considers that the mangels and potatoes which rot in the clamps during winter are the ones that have got frosted before lifting.

As the effects of the frost are sometimes invisible, and it is no easy matter to pick out the affected roots, lifting should be completed as early as possible, before the October frosts.

FORAGE CROPS. MEADOWS, AND PASTURES.

653

CROWTHER, CH. and RUSTON, A. G. **The Influence of Time of Cutting upon the Yield and Composition of Hay.** — *The Journal of Agricultural Science*, Vol. IV, Pt. 3, pp. 303-317. Cambridge, January, 1912.

Great Britain: England

It is well known, especially on the Continent of Europe, that a delay of only a few days in cutting may lead to serious depreciation in the value of the hay crop. This question is of great practical importance also in England, where hitherto it has received but little attention, especially as there are many possiblities of variation (owing to climatic conditions) from the general conclusions drawn from continental work.

Accordingly experiments have been carried out on an estate in Yorkshire in two neighbouring fields with similar soils, in 1909 and 1910. The two hay crops were grown in rotation with cereals. The fields were divided into four plots according to the different dates of cutting (four, from 10 June to 3 August, 1909, and four from 9 June to 21 July, 1910).

The seeds mixture was as follows:

Perennial Rye Grass	2	parts;	Alsike.....................	3	parts
Italian Rye Grass	2	»	English Single-Cut Cowgrass	1	part
White Clover	4	»	Chilian Red Clover.........	1	»
Trefoil	»	»	Ribgrass...................	1	»

The manurial dressing given on May 11, 1909, was: nitrate of soda, 1 cwt., superphosphate, 2 cwts., sulphate of potash, ½ cwt., and muriate of potash, ¼ cwt. per acre. The rainfall in 1909 from April to Aug. 3 was 12.48 inches, and in 1910 from April to July 21 it was 9.29 inches.

The analysis of the 1909 crop gave the following chief points of interest:

1. The steadily increasing proportion of crude fibre throughout the whole eight weeks.

2. The gradual fall in the proportion of *amides* up to the third cutting, after which reduction was very pronounced.

3. The fall in the proportion of true protein during the moist latter half of June, followed by a steady rise up to the period of the fourth cutting.

4. The gradual reduction in the proportion of carbohydrates after the second cutting.

5. The relatively high proportion of pentosans throughout the whole period.

6. The increasing of the ash in silica, whilst the proportions of K_2O and P_2O_5 tended to fall.

7. The crop became steadily less digestible as growth advanced, the maximum yield of valuable nutritive matters being attained at the third cutting.

Adding these results to those of 1910 we reach the following general conclusions which supplement what has been hitherto known.

1. The composition of hay steadily changes throughout the period commonly covered by the hay-making season.

2. The nature of the change depends to some extent upon the character of the season.

3. In both seasons there was a steady fall all round in the digestibility of the hay, which in the end more than counterbalanced the increase in weight of the crop.

4. In both seasons the best results were obtained by cutting about the beginning of July. A certain latitude in the time of cutting — a week, or 10 days — may be allowed, without doing much harm. But after the middle of July an appreciable deterioration set in.

654 O' Connor, J. M. B. **Berseem or Egyptian Clover** (1). — *The Producers' Review*, Vol. VI, No. 10, pp. 476-477. Perth, January 20, 1912.

Australia

At the Brunswick State Farm, Western Australia, six acres of high land were sown last year with Berseem or Egyptian clover

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(1) See *B.* Nov. 1910, p. 61; March 1911, No. 812; Augt.-Sept.-Oct. 1911. No. 2566. (*Ed.*).

(*Trifolium Alexandrinum*), 4 lbs. of seed per acre, together with half a bushel of Italian rye grass, and half a bushel of barley per acre, to act as a cover crop for the young clover plants.

The land was manured with 1 ½ cwt. of Thomas' phosphate, and top-dressed during the growing season with 5 cwt. of lime to the acre, and a month later again top-dressed with blood manure (1 cwt. per acre). The soil is a light loam, intermixed with gravel, with a clay subsoil.

Although it was not irrigated, this crop showed a splendid germination and quick growth of succulent stems and leaves during the early winter months, when lucerne and other grasses were at a standstill. Animals are particularly fond of Berseem, and the experiment has been in all respects so satisfactory that the Department is arranging to distribute the seed in small lots to farms at cost price.

COUSTON, F. **Arabian Lucerne on the High Plateaux of Algeria.** (La Luzerne d'Arabie sur les Hauts-Plateaux de l'Algérie). — *Bulletin agricole de l'Algérie et de la Tunisie.* Alger, 1911. **655**

Algeria

At Bordj-bou-Arrérdj, at 3 000 feet above sea level and under a dry climate, experiments have been made with three kinds of lucerne, namely: Arabian Lucerne (from Mitidja), Sétif Lucerne, and one kind indigenous to the country.

They were sown on April 9th 1911, in lines 3ft. 3 in. apart (Ryf system) on ground ploughed in the spring.

Owing to want of rain, the plants did not sprout till May; on the 15th of June they still showed but thinly and their vegetation was not vigorous. After the May rains and again after the July storms the horse hoe was used to prevent the drying of the soil.

In October, after the first small showers, the Arabian lucerne possessing powerful tap-roots, had formed vigourous tufts. showing that it had taken possession of the soil, notwithstanding the exceedingly dry summer of 1911.

The Sétif lucerne followed it closely but without equalling it.

The native lucerne proved much inferior, germinating very irregularly.

In a comparative experiment on irrigated plots, Arabian lucerne again took the lead, both in its early sprouting and in the development of its stems.

Though these tests are still in their preliminary stages, the Author communicates his first observations in case they might be useful to other agriculturists who are following similar investigations.

FIBRE CROPS.

656 SHERRARD, G. **Report on the Cultivation of Cotton on the Experimental Farms of Bengal during the Year 1910-1911.**— *Department of Agriculture Bengal, Quarterly Journal*, Vol. V, No. 2, pp. 59-64. Calcutta, 1912.

British India: Bengal

Early in March 1911 the Imperial Cotton Specialist visited the Experimental Station at Chinsurah in company with the Deputy Director of Agriculture. His Report on the cotton grown on the lower land, at the general level of the farm, is not favourable. The inevitable conclusion to be drawn, he says, from these experiments is that the conditions of soil and climate are not in any way suitable for cotton cultivation in the deltaic area of Bengal, where more highly renumerative crops, such as rice and jute can be grown ; experiments directed with a view to introduce this cultivation, should not be persevered with, but the trials of Cambodia and Bhuri cotton on a small scale, for a few years, could be continued, just to test the behaviour of these varieties in an unsuitable environment.

The opinion of the Imperial Cotton Specialist is confirmed by the results of the growth of cotton on five farms, during the year under report, as will be seen from the following tables ; and the writer thinks that the Department of Agriculture may safely conclude that cotton is not a paying crop under ordinary circumstances on the Gangetic plain in the Bengal Province.

On the Dumraon and Burdwan Farm the crop entirely failed to produce bolls.

On the Bankipur, Chinsurah and Hazaribagh Farms the following results were obtained.

Bankipur Farm.

Variety	Cost of Cultivation per acre	Outturn per acre	Value per acre	Profit per acre	Loss per acre
	£ s. d.	lb.	£ s. d.	£ s. d.	£ s. d
Bhuri	1 4 0	120	3 5 4	2 1 4	—
Cambodia	1 4 2	12	0 5 4	—	0 18 10

Chinsurah Farm

Variety	Cost of Cultivation per acre			Outturn per acre	Value per acre			Profit per acre			Loss per acre		
	£	s.	d.	lb.	£	s.	d.	£	s.	d.	£	s.	d.
Bhuri, I Class Land . .	10	8	0	548	14	8	0	4	0	0		—	
Cambodia, I Class Land .	11	5	2	321	8	2	8		—		3	2	6

Hazaribagh Farm.

Variety	£	s.	d.	lb.	£	s.	d.	£	s.	d.	£	s.	d.
Bhuri	3	1	11	411	11	17	4	8	15	5		—	
Cambodia	3	1	11	411	11	6	8	8	4	9		—	

The varieties Bhogila and Deshila were also tried.

The high cost of cultivation per acre at the Chinsurah Farm is in part due to the large sums spent on meeting the attacks of insect pests, among which were: Behar Hairy Caterpillar (*Diacrisia obliqua*), the cotton Leaf-roller (*Sylepta derogata*), and the Red Cotton Bug (*Dysdercus cingulatus*).

It must also be noted that the value and profit per acre given in the tables are based on the figures derived from samples of the various varieties sent from each farm to the Imperial Cotton Specialist and forwarded by him to Messrs. Tata Sons & Co., Bombay, for valuation. Values are therefore in excess of that which could be obtained for the cotton locally.

WILLCOCKS, sir WILLIAM. **Cotton in Egypt in Relation to Irrigation, Drainage, and the New Hydraulic Works.** (A crop of Ten Millions Cantars). (Le Coton en Egypte en rapport avec l'irrigation, le drainage et les nouveaux travaux hydrauliques. Une récolte de dix millions de cantars). — *Bulletin de l'Union des Agriculteurs d'Egypte*, N. 81, pp. 294-315. Cairo, 1911. **657**

Egypt

From 1891 to 1900 the Nile waters at the Delta dam reached a height of 14 metres (45 ft. 6 in.) and the area under cotton, 1 000 000 feddans (1 141 800 acres), produced 5 450 000 cantars (1) (about 241 000 tons), or an average of 5.5 cantars per feddan (about 4 $^1/_4$ cwt. per acre).

It was in that period that the greatest crops of Egyptian cotton were harvested. In 1903 the Assouan dam began to act. From

(1) 1 cantar of ginned cotton = 99.049 lb.
1 » » unginned » = 311.366 lb.
The first is the most commonly used. (*Ed.*).

1903 to 1910 the area under cotton increased by 308 700 acres, but the yield of cotton per acre, diminished by 0.85 cwt. This lesser yield is said to be due to the great extent of inferior land planted to cotton of late years, but this is not true, because just the reverse happens in the Delta, where the land that was formerly of inferior quality and salty, and yielded but scantily, has been drained and improved, and produces to-day splendid crops. On the contrary it is from the good lands that the poorer crops are harvested.

The excess of water which favours the cultivation of maize, so dear to the fellaheen, has protected the irrigated area against drought, but is has at the same time increased the danger from the Cotton boll worm which, under the natural climate of Egypt could not have been injurious. If the Government had not acted promptly the worm would have destroyed the whole crop in wet years. The clover fields are adjacent to the cotton fields; the former are irrigated in June and the food they afford enables the worm to bridge over the critical period of its existence. The worm feeds on clover until the young cotton plants (now sown much earlier than formerly) give enough shade to shelter it.

Between the 15th of June and the 15th of July the perfect insects lay their eggs on the leaves of all the tender plants they find, and in five days time the eggs hatch out. If the cotton fields are kept dry and the plants are hard and fibrous, millions of worms perish, if on the contrary the plants are tender and the air is moist, the worm destroys the plants, and going through its metamorphoses it threatens greatly next season's cotton.

It must also be noted that the high level canals have permanently raised the spring water table, and have thus reduced the depth of the soil in which cotton can grow, and this to such an extent that in a great portion of the Delta instead of a resistant and hardy plant with long roots. a tender plant with short roots is produced, which cannot live without frequent watering. All this has favoured the development of the worm. To obviate these drawbacks the canals must be excavated to the depth they had formerly, and they must be allowed to irrigate freely only when they are full. Maize must not be irrigated in June and July but only during the month of August. If the growing of clover can not be prevented it can be forced, so as to have one good cut in April instead of three every season; then another crop should be introduced into the rotation, or the land allowed to lie fallow after the end of April.

The land situated towards the North of the Delta, about 1 235 000 acres in extent is for the most part more or less salty und lies above the level of the lakes. The whole of it is susceptible of improvement by irrigation and drainage; because its Delta formation renders drainage very useful. It must not be forgotten that the want of the red muddy water would spell disaster for Egypt. The only means of ensuring this rich red flood water for the above lands is by providing the canals with outlets. In the Nile Delta as well as in those of the Tigris and of the Euphrates it is essential to allow the muddy flood water a free course in the canals so as to give the lands the benefit of the silt carried by the water; it is equally important to enable the infiltration water to drain off into the deep drains, in order to prevent the salt which impregnates the soil from rising to the surface, and to collect these waters into one and the same channel.

Thus, by providing the higher portions of the soil of Egypt with canals and its low lying parts with drainage; by providing the canals with outlets for conveying the red flood water to the most distant fields; by keeping the spring water table in the South fairly low by means of a suitable irrigation and in the North by good drainage; by turning the water from the reservoirs towards the fallow lands of the North; by giving the cotton region of the South as dry and warm a summer as the seasons allow, and lastly by utilising the flood waters at the natural and inevitable time, Egypt will be able to yield about 10 000 000 cantars (about 464 000 tons) of cotton, $^9/_{10}$ from Lower Egypt and $^1/_{10}$ from Upper Egypt.

Nevertheless all this enormous crop would be menaced if a flood like that of 1898 were to happen again. At an expense of £5 000 000 the Wadi Rayan reservoir could be constructed; this work would protect Egypt from premature floods. In addition, two barrages on the White Nile, at Omdurman and at Gordon's Tree, the cost of which is estimated at £1 600 000 would diminish considerably the duration of prolonged and excessive floods.

HAUTEFEUILLE, L. **The Fibre Crops of Java.** (Le congrès des textiles de Soerabaya). — *Journal d'Agriculture tropicale*, 12e Année, No. 127, pp. 4-7. Paris 31 Janvier 1912. **658**

This rapid account of the Textile Congress notices some recent work on various fibres.

After having remarked upon the slight consideration given by the Congress to the Russian fibres and to jute, the author men- **Java**

tions a report by M. W. A. Zegers Rijsez on *Hibiscus cannabinus*, deccan hemp, which gives splendid crops in Java.

Crotalaria juncea, which succeeds wonderfully at La Pho (Tonkin), does not appear to give good results of Java.

Cotton is the chief subject treated in two papers by Mesrs. Breda de Haan and D. J. G. van Setten on local native crops.

Textile *Agave* holds an important position in those parts of Java subject to relative drought. The Congress recognized the importance of the subject at the present time and followed with interest the communications of E. de Knijff, general secretary of the Congress, the remarks of the director of one of the most important Java plantations and Professor Lister H. Dewey's important contribution which rectified several errors and pointed out with precision the incomplete data.

A useful discussion took place on the distances to be kept between the plants, on the selection of varieties and of the soil, on the best time for the harvest, on its further treatment and packing. A resolution was adopted in favour of large central works rather than small ones for preparing the fibre.

Interesting papers were also read on "Poeroen" (*Lepiconia mucronata*), on "Mendoeng" a variety of the same plant and on several species of *Pandanus*.

The insuccess of Abaca, Manila hemp, was confirmed. This fibre seems to succeed only in the Philippines and in those islands having similar soils and climate.

As kapok represents one of the chief items of the wealth of Java, the sitting devoted to it was one of the most important. A paper on the kapok trade by Mr. W. Cock-Buxing was read, as well as a complete study by Mr. F. L. Bley on its requirements, cultivation, pests, crop and preparation of the fibre.

Eriodendron anfractuosum seems to be the most widely spread tree in the island. About 8000 tons of kapok are exported every year.

Pine apple fibre and the various ways of preparing cocoa-nut fibres were also discussed.

SUGAR CROPS.

GRABNER, E. **Sugar-Beet in Hungary. Cultural Precautions for 1912 to provide against the Lack of Seed.** (1) (Mittehetünk a czukcorrépa vetömaghiányból eredö bajok elhárítúsára ?). — *Köztelek*, No. 18. Budapest, 2 March, 1912. 659

The effects of lack of success in the attempts to improve the cultivation of beets for seed in Hungary are particularly felt this year owing to the smallness of the beet-seed crop in Germany last summer. Hitherto the only disadvantage of the lack of local seed has been that a sum of 1 ½ to 2 million crowns (£60 000 to £80 000) has gone abroad for the purchase of seed; but this year the actual beet crop is threatened. **Hungary**

While the crop of seed in Germany last year was only about a fifth of the normal, the Russian crop was fairly good in quantity, though poor in quality. As most of the seed-merchants went to Kiew, the centre of the Russian trade, the price went up in less than six weeks from 30 marks to 130 marks per 50 kilos (from £1-10*s* to £6-10*s* per cwt.), and the stock was soon exhausted. Fortunately, the Hungarian factories have permanent contracts with the German merchants, so that they run less risk than other countries, such as Germany, where the growers are advised to reduce their sowings by 30 %. Nevertheless there may be a difficulty in getting seed for second sowings, so that every precaution must be taken that the first sowings are successful; more care must be taken than usual, as even the seed from the best German seedsmen is prematurely ripened.

While, however, the quality of the seed is not good, this may be counterbalanced by the fact that it contains more germs per unity of weight than usual; according to German experiments 1 kg. of 1911 seed will in 12 days give 100 000 to 135 000 seedlings, as compared with 70 000 to 85 000 in normal years.

Another circumstance making careful cultivation more important than usual, is that there will be less area under sugar beets, and the consequent rise in price ought to make successful crops highly remunerative.

(1) See *B.* Jan. 1912, No. 111. (*Ed.*).

The primary condition for success in sowing is thorough preparation of the soil, so as to obtain a fine and even tilth in which the seed can be sown at a regular depth; this will ensure even germination, which will further protect the crop from parasites.

After drilling, the ground should be well rolled; Kuffner rolls weighing 88 lb., used on the sugar beet farm at Diosseg, have done excellent work. If one of these is fixed behind the drill, and at the same time an iron-wire brush is fixed in front to cover in the tracks of the draught animals, perfect drilling results.

Drilling should be got through as early as possible, provided the season is not backward. A good plan is to drill in a little barley — 7 to 8 lb. per acre — with the beets, so that if the germination of the beets is slow, the rows can be seen by the quicker-growing barley, and hoeing can begin earlier: of course the barley can easily be cleared away at singling time.

After drilling it is well to roll thoroughly with segmented or toothed rollers.

It is much to be hoped that the area sown will not diminish in spite of the unfavourable circumstances of this year.

RUBBER, GUM AND RESIN PLANTS.

660 HELFFERICH, EMIL. **The Progressive Development of Rubber Culture in South East Asia.** (Die weitere Entwicklung der Kautschukkultur in Südostasien.). — *Der Tropenpflanzer.* 16 Jahrg. Nr. 1 pp. 15-34; Nr. 2, pp. 73-87. Berlin, Januar und Februar, 1912.

S. E. Asia

The rubber boom is passed. In spite of all prophecies, the price of rubber has returned to its normal level, that, namely, which is determined by the actual relations between demand and supply.

It is now clear that *Hevea* is the most desirable rubber culture, as well in West Africa as in South East Asia where its superiority to *Castilloa* and to *Ficus elastica* is distinctly marked. The latter especially, which was for a long time preferred by the Dutch, has been very disapponting.

As regards *Manihot* opinions are still divided, but in any case it is certain that it is not superior to *Hevea*. The rough fashion of preparing the land for rubber planting, as largely adopted on English estates, has been proved to be a great mistake. The trees

were simply felled and burnt, and no further attention was paid to the soil. The roots were left in the ground, and the wood, which had escaped the fire, was only removed where the *Hevea* plants were actually to be placed.

During the time of the boom, all the seed that could possibly be got was planted, but now care is taken to select the seeds that come from plantations bearing a good name.

As regards the space between the plants, the smaller distance of 12 × 12 feet has now been given up. The usual distances are as follows:

13 × 18 ft.	=	186	trees	per	acre
15 × 15 »	=	193	»	»	»
18 × 18 »	=	134	»	»	»

Intercalary cultures have been mostly abandoned in the Malay Peninsula. But on Java and Sumatra the Robusta coffee is intercalated with very satisfactory results.

According to English opinion, *Hevea* grows better in the Malay Peninsula than in Java. This is true where in Java it has been planted in soil already cultivated, or on secondary forest land, but on virgin forest land it grows as well as in the Straits. There are many different methods of tapping, but the one at present most in favour is the half fish-bone incision extending over one fourth of the circumference of the trunk.

The quality of the rubber depends to a large extent on the age of the trees. The rubber of young *Heveas* is softer and of less value than that from older trees.

At Pasir Oetjing in Java, with plants aged from 4 to 6 years, last year's yield was as follows:

1st Quality	63.87 ½ %
2nd »	11.28 »
3rd »	17.72 ½ »
4th »	7.12 »
	100.00 %

The supply of land suitable for rubber plantations has for a long time exceeded the demand. All fear of lack of labourers has passed away. Chinese immigration is constantly increasing. The immigration of Java Coolies to the Straits was never so important that its diminution or cessation could endanger the rubber industry

there. The want of labourers on Sumatra is chiefly covered by Java. On an average wages on Java are only 50% of those in Malacca and on Sumatra. The Chinese are not so clever in tapping as was expected.

661 WILDEMAN, E. DE. **On the Mechanical Extraction of Rubber.** (A propos des Procédés d'Extraction mécanique du Caoutchouc). — *Journal d'Agriculture Tropicale*: 12e Année, No. 127, pp. 2-4; Paris, 31 Janvier, 1912.

Belgian Congo

Experiments have recently been made in Paris on the Extraction of rubber by means of the Guignet apparatus, and Mr. Wildeman observes that he has always been in favour of extraction by beating. Some account of the treatment of *Funtumia elastica* by the natives of the Belgian Congo may here be given.

The Bayanzi of the lower Kwilu (Belgian Kasai-Congo) cut down the tree when its diameter measures 15 to 20 cm. (5.90 to 7.87 in.) at its base. The trunk is stripped of its branches, which are thrown away, and then heated by exposure to a fire, until the bark detaches itself, when it can easily be removed.

The bark is first macerated and then beaten, in the village, like that of *Landolphia Thollonii* and other rubber-producing lianas. The first mass obtained is usually plunged into boiling water. As a rule the natives only do this once, so that the rubber is very impure, a second beating and boiling being greatly needed.

The most unsatisfactory part of this rudimentary process is the exposure of the bark to the fire.

It is, nevertheless, necessary. If the latex does not coagulate, before the beating, the latter is useless. But if the heat be too great, the bark may be partially burnt, and the quality of the rubber greatly reduced.

It is not the process itself, but its faulty application that spoils the rubber, and it is for mechanicians to invent an apparatus perfectly adapted to the conditions. According to Mr. Wildeman, mechanical methods for extracting, either directly from the plant, or from the latex, the rubber contained therein, are sure to be adopted in the future.

662 GRISARD, JULES. **Wood-Oils**. (Les Huiles de Bois). — *Bulletin de l'Office Colonial*, No. 49, pp. 1-7. Melun, Janvier 1912.

French Indo-Cina

Although it is incorrect to use the name "wood-oil" for the liquid oleo-resin derived from exudations from the trunk of species

of *Dipterocarpus*, yet it is better to retain it to show the origin of the product and to avoid confusion.

The species of *Dipterocarpus* of the French possessions in the Far East which furnish most oleo-resin, are in order of importance: *D. alatus*, *D. tuberculatus*, *D. intricatus*, *D. artocarpifolius*, and *D. Jourdaini*. Besides these, there are *D. incanus*, *D. zeylanicus*, *D. hispidus*, *D. gracilis*, and *D. littoralis* of the British and Dutch Indies (1).

The industrial and medical use of this oil is constantly extending.

The oil is collected from special incisions; it goes on flowing for as much as six months, but the time varies with the species. The oil obtained during the dry season is the best. Some trees give as much as 45 gallons a year, but 18 gallons is an average. The operation may be repeated ten times without interfering with the growth of the tree.

The colour of the oil varies from yellowish white to blackish brown according to the species of *Dipterocarpus*. It is composed of a resin and a hydrocarbon essential oil, slightly yellowish, with a slight odour, and soluble in absolute alcohol; from the resin is extracted a crystallisable acid called gurjunic acid.

The oil is used for calking the native boats, making torches, polishing furniture and other articles, and for preserving wood. It has also been tried in the manufacture of linoleum. The white oil, or "shondrau", the most prized, is used in China in getting up lacquer work.

By distillation, a gas with high lighting-power might be obtained from wood-oil.

The medicinal properties of this oil are similar to those of copahu; it is used under the name of "gurjun balsam", and is

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(1) *Dipterocarpus grandifluus* (Philippines) gives a resin-balsam, called "apitong oil" or "balao balsam", containing 25-40 % of ethereal oil as well as resin and water. *D. vernicifluus* (Philippines) gives "pana oil" or "malapaho", containing c. 35 % ethereal oil,40 % resin, 25 % water. *D. turbinatus*, *D. alatus*, *D. laevis* (Burma) give the resin-balsam known as "kanyn oil", which, mixed with "inoils" (from *D. tuberculatus*, *D. incanus*, *D. obtusifolius*, *D. pilosus*, *D. Griffithii*, all from Burma), forms the commercial product known as "gurjun balsam", "balsamum garjanae" or "wood-oil"; this contains ethereal oils (20-82 %), resin (up to 54 %), bitter principles, and acetic acid. Other species yielding oils are: *D. angustifolius*, *D. retusus*, *D. hispidus*, *D. littoralis*, *D. zeylanicus*, *D. trinervis*, etc. all from South-East Asia. (C. Wehmer, *Die Pflanzenstoffe*, pp. 499-500. Jena, 1911). (*Ed.*).

also exported from Siam and the Malay peninsula; in London it is sold under the name of "East Indian copahu".

The fruit of the abrasin (*Aleurites cordata* Stend.) contains three large seeds with kernels, which furnish abrasin oil, whose yield is 50 to 60 % of the weight of the kernels, or 20 % of the whole seeds.

This oil is limpid, colourless and nearly solid when cold, but reddish yellow and viscid when hot. It is used for protecting wood, iron and ropes from damp. In China and Japan it is used for ordinary painting. It may be used for lighting without any preparation. When suitably prepared it can be used as putty in glazing, as a varnish, and for soap-making. It is used for skin-diseases and for warming the surface of the body after asphyxiation. Further, it is a strong insecticide.

The candlenut (*Aleurites triloba* Forst.) (1) contains a kernel which yields a fixed oil, which is limpid and of a pale yellow colour, and has a pleasant smell and slightly bitter taste. The kernels yield 50 to 60 %. The oil is used for soap-making, drying colours, dressing leather, and lighting lighthouses. In Tonking it is extracted from the fresh nuts and used as food. The cake makes an excellent manure, but it is dangerous for feeding stock, though it has been used with success for poultry and pigs mixed with sweet fruit, such as papayas and guavas.

VARIOUS CROPS

668 **The Conditions of Tobacco-growing in Hungary.** Official Publication of the National Hungarian Farmers' Association. — *Köztelek*, 22 Year, No. 13, pp. 431-434. Budapest, 14 February, 1912.

Hungary

Twenty years ago tobacco cultivation in Hungary was very flourishing, and heavy crops of good quality were produced.

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(1) Native of Oceania; now cultivated in India, Java, the Moluccas, the West Indies, Reunion, and South America. The seed (candlenut) consists of 57 % husk and 43 % kernel; the latter contains 3.7-9 % water, 59-64 % fat, 17.4-23.7 % protein, 5.9-6.8 % N-free extract, 1.6-2.7 % crude fibre, 2.8-4.3 % ash. The oil-cake contains 35-47 % protein. The oil contains glycerides of linoleic (30 %), stearic, palmitic, myristic, and oleic acids, besides many free fatty acids (to 56.4 %), and elaeomargarinic acid. (*Loc. cit.*, p. 434).
(*Ed.*).

Lately, however, owing to changing conditions, particularly the increase in the price of land and of labour, this crop has become much less important. Increase in the import duties has not served to stop the diminution.

The most serious side of the question is the loss of employment of the labourers who are specialists in tobacco-cultivation, and form a kind of caste not fitted for other work, having followed this occupation for generations.

On the initiative of M. Edmond de Miklós, the proprietors interested in the question met to form regional assemblies in the chief centres of the industry; the National Federation of Farmers' Associations and the General Direction of the Tobacco Monopoly were also represented.

A resolution was passed requesting the Ministry of Finance to carry out the following measures as soon as possible:

1. That the Ministry should modify the rules at present in force on the manner of delivery and the duties, so as to simplify the classification of the qualities and arrange for the prices to be from 55 to 120 crowns (£ 2. 5*s* 10*d* to £ 5.) according to the different classes and species of tobacco, and that these measures should start from the coming year.

2. That the Ministry should abolish the tax on concessions for tobacco-growing, which has no reason for existing.

3. That the allowances of indemnity on transport be generalized, regardless of distance, and be fixed at 5 fillers (½ *d*) per quintal per kilometer.

4. That the juridical and administrative relations between the proprietors and the merchants should be regulated.

5. That regulations should be made to allow of the possibility of insuring only tobacco against hail, without having to insure all the other crops on the same holding.

According to very careful data presented at the regional assemblies, it is impossible, at the present prices of land, labour and tobacco, for either proprietor or labourer to get a profit from this crop.

If this situation is not soon modified, a large number of proprietors will be obliged to give up this very important branch of Hungarian farming, to the loss of the Tobacco Administration and the country as a whole.

From detailed investigations it appears that the cost of cultivating an area of 4 arpents (5 3/4 acres), which is the amount that can be undertaken by an average labourer's family, including rent, cultivation, manuring, etc., is 952 crowns (£39 13*s* 4*d*); if the crop

be taken at 10 qls. per arpent (14 cwt. per ac.) and the average sale-price at 44 crowns per quintal (18*s* 4*d* per cwt.), the gross return is 880 crowns (£36 13*s* 4*d*) for the proprietor, and the same for the labourer. This sum does not cover the expenses of the proprietor and gives to the labourer a daily wage of 1 crown 24 fillers (1*s* 0 ½*d*) not half that paid in other branches of agriculture.

Several proprietors present at the assemblies considered that these figures were too high, and that the real state of affairs is even worse than represented.

664 LUNDIE, MARSHALL. **Notes on Investigations on Some South African Tobaccos.** — *South African Journal of Science*, Vol. VIII, No. 6, pp. 186-191. Cape Town, January 1912.

Union of South Africa

The cultivation of tobacco recently became so important in Cape Colony that the Government appointed an expert to investigate it and draw up a report. From this it appears that the cultivation of tobacco is carried on in a very primitive manner, an excessive manuring with sheep's dung being used. This brings about an excess of chlorides, with the result that the tobacco has much too high a percentage of nicotin and of ash. Analyses of different kinds of South African tobacco prove that there are insufficient quantities of lime and potash.

In Cape Colony, sheep's dung must be used as a fertiliser, but its evil effects may be to a large extent counteracted by green manuring.

The following results are the average of at least three determinations made most recently on a number of tobaccos obtained from new countries like the Transkei and Rhodesia.

Locality, etc.	Nicotin per cent.	Ash per cent
Virginian Leaf (Hester), flue-cured, Rhodesian Grown	2.15	12.15
Turkish Tobacco, Rhodesian Grown	2.52	10.25
Pondo Tobacco, Elliotdale District, Pondoland . . .	1.45	14.58
Kafir Tobacco, Willowvale District, Transkei	1.13	14.26
Karoo Tobacco, Oudtshoorn	4.92	19.16
Cango Tobacco, Oudtshoorn	1.44	12.02

It is of interest to compare these results with the composition of some of the more famous varieties of tobacco, most of which contain 17.2 % of ash, whereas the percentage of nicotin varies.

Best Havana Tobacco	contains	2.5	per	cent.	of nicotin
Brazil	»	»	2.0	»	»	»
Sumatra	»	»	4.12	»	»	»
Kentucky	»	»	4.53	»	»	»
Maryland	»	»	1.26	»	»	»
Domingo	»	»	0.82	»	»	»
Ohio	»	»	0.68	»	»	»

Those parts of South Africa which have summer rains, Transkei, Natal, Transvaal, and certain parts of Rhodesia, could undoubtedly produce very high class tobaccos, were proper methods of cultivation applied.

MARKET — GARDENING.

HITIER, H. **Market Gardening in France.** (La production horticole en France et son commerce). — *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, 110e Année, Tome 116, No. 10, pp. 497-509. Paris 1911. **665**

Market gardening and fruit growing in France have become to-day an important branch of agriculture; it is a good many years ago that their produce ceased to be limited by local consumption, and entered the domain of international trade. **France**

The market garden produce of Algeria, such as grapes, early potatoes, tomatoes, haricot beans, and artichokes are exported to very considerable distances; and the same is done with the strawberries of Plougastel, of Hyères and of Carpentras, with the melons of Cavaillon, the cherries of the Var, Roussillon and Ardèche districts and of Montaubau, the peaches of the south of France and of the Rhone valley, the Chasselas grapes of Fontainebleau and of the Garonne valley, the plums of Algenais, the artichokes of Hyères and of Roscoff, the green peas of Brive, the cauliflowers of Roscoff and Angers, and the flowers of the Var and of the Alpes Maritimes departments.

At first all this produce flowed to Paris. The central markets of Paris became a market not only for the inhabitants of that city, but also for the great neighbouring centres of population which constantly increased the amounts of their purchases in the Paris markets, until the modifications in the railway tariffs and the competition among the middlemen facilitated the direct exportation from the producing to the consuming centres.

The railway tariff modifications consisted at first in the introduction, in 1881, of the 3 kilogram (6.6 lb.) parcel post, at a uniform rate for the whole of France. In July 1892 the weight allowed per parcel was increased from 3 to 5 kilos (11 lb.). In September 1907 to 10 kilos (22 lb.) and in November 1911 to 40 kilograms (88 lb.).

Without doubt the bulk of the tonnage is still handled by the wholesale trade, but a great number of consumers are supplied directly by means of the parcel post.

But this is not all. Formerly almost all the special tariffs for carriage by fast goods trains contemplated Paris as their only terminus. Now, the railway companies have extended the special tariffs to the various stations of their lines, which may forward goods directly to each other at reduced rates.

The following table gives the tariffs for the carriage of fruit and vegetables, by fast trains, in 1880, 1890 and 1905 from certain stations to Paris and to Boulogne.

Tariff for the carriage of fresh fruit sent by the P. L. M. Ry. Freight per ton, without limit as to quantity, extras included, from the following stations to Paris.

1. Inland Tariff.

Stations	Distance Miles	Freight 1880			Freight 1890			Freight 1900			Difference in Freight: Between 1880 and 1890				Difference in Freight: Between 1880 and 1900			
		£	s	d	£	s	d	£	s	d	£	s	d	%	£	s	d	%
Hyères	568.49	11	9	2.5	9	12	4.6	5	17	2.7	1	16	9.9	16 —	5	11	9.9	48.79
Marseille Joliette	514.44	10	8	8.3	8	19	5.8	5	15	7.6	1	9	6.5	14.03	4	13	0.7	44.96
Avignon	448.58	9	2	9.4	7	18	11.6	5	11	11.8	1	3	9.7	13.03	3	10	9.5	38.73
Lyon-Brotteaux	303.82	6	8	2.5	4	13	9.2	4	8	2.1		14	2.0	11.06	2	0	6.7	31.68

2. From following stations to Boulogne, Export Tariff.

Hyères	732.51	14	16	6.1	12	19	8.2	8	3	2.6	1	16	9.9	12.42	6	13	3.6	44.95
Marseille Joliette	677.84	13	15	13.9	12	6	9.4	8	1	5.6	1	9	6.5	10.58	5	14	6.3	41.49
Avignon	661.98	12	10	11.3	11	6	3.3	7	17	9.8	1	3	9.7	9.52	6	12	8.4	36.86
Lyon-Brotteaux	467.84	9	15	2.9	9	1	1.8	6	13	3.6		14	2.0	7.25	3	2	0.3	31.75

Tariff for the carriage of fresh vegetables sent by the P. L. M. Ry. to Paris.

Freight per ton.

											£	s	d					
Hyères	568.49	7	10	10.5	7	7	9.83	5	10	10.0	— »	3	0.7	2.02	2	0	0.5	26.54
Avignon	448.58	5	17	5.5	6	0	3.34	4	11	1.4	+ »	2	5.05	2.05	1	5	11	21.98

to Boulogne sur Mer:

Hyères	732.51	10	18	2.1	10	15	1.45	7	12	10.8	— »	3	0.7	1.40	3	5	3.4	29.92
Avignon	611.98	9	5	1.9	9	7	9.82	6	14	1.1	+ »	2	5.1	1.31	2	11	1.2	27.63

The P. L. M. in 1902 lowered its tariffs for vegetables; it made in 1905 special tariffs for table grapes in parcels of 50 kg. (110 lb.) and in 1907 a seasonal tariff for artichokes, cabbages, cauliflowers, haricot beans, green peas and salads.

Lastly, in 1906-1907 exceptionally low export freight tariffs were introduced: according to which from Hyères to Boulogne-sur-Mer (special tariff for England) a ton of fruit in 50 kg. (110 lb.) parcels pays for 1 179 kilometres (732 miles) 130.45 fr. (£5.3*s* 6 ½*d*) and a ton of vegetables 121.45 (£4.16*s* 4 ¾ *d*).

Exportation to West Germany has been especially favoured: a ton of fruit from Hyères to Jeumont 1 066 kilometres (662 miles) pays 115.80 fr. (£4.11*s*. 10*d*) and a ton of fresh vegetables 99.80 fr. (£3.19*s* 2 ½ *d*).

Besides lowering the tariffs, the railway companies have much improved the carriage of fruit and vegetables by considerably reducing the duration of the journeys. Generally, provision trains employ 22 to 24 hours on the 863 kilomet. (536 miles), run from Marseille to Paris and 18 to 20 hours from Avignon to Paris (460 miles).

During the season, garden produce from Avignon reaches its destination within the following time:

London 38 hours.
Frankfurt-on-the-Main 33 hours.
Hannover 60 hours.
Berlin 61 »
Hamburg 65 »
Bremen 66 »

This rapidity of transport has especially facilitated the exportation of the more perishable kinds of fruit and vegetables.

The rolling stock used for the carriage of these commodities has also been much improved — at first special vans were built, in which ventilation was provided for by moveable shutters, resembling Venetian blinds, in the upper parts of the sides. Later railway vans were built with double sides enclosing a non-conducting air space between them. Lastly, the outsides of some are painted white, so as to diminish the absorption of heat, and others are fitted with interior passages so as to enable the company's agents, while travelling, to classify the parcels according to their destination.

The markets for the sale of fruit and vegetables increase in numbers and importance every year. Besides Paris, there are now the great markets of England and Germany and the important centres of consumption in France itself.

Thus in 1908 the P. L. M. Ry. lines carried 26 000 tons of fruit and 15 600 tons of vegetables addressed to various destinations in Switzerland, Germany, England and Belgium, and 36 100 tons of fruit and 36 600 tons of vegetables to Paris and other French centres beyond Paris.

As for the flowers gathered on the coast of the Mediterranean 5 333 tons were sent abroad, and 4 595 tons to Paris and to French centres beyond Paris.

The principal points to which the attention of all those interested in the fruit trade should be drawn, may be summarized as follows:

To produce specially for exportation, and to establish a commercial brand by the honesty and excellence of the goods exported.

To export to each country only those products which meet the requirements of local customers.

In this respect agricultural associations might do very useful work in supplying the producers of the various regions with the necessary information; they might also, together with the professors of agriculture, carry on a most useful propaganda for the systematic control of garden and orchard pests.

It is also highly important to develop the cold storage industry in the chief centres of production, and as it is proven that only absolutely sound fruit can be kept in cold storage, one can foresee that agricultural cold stores will have to be provided with an annex for the preparation of preserves, where over-ripe fruit may be dried or converted into jams, jellies etc.

Since the railway companies set the example, followed by agricultural associations, of organizing shows of packing materials, a real packing industry has arisen in France.

Many railway companies carry returned empties free of charge; it would be in their interest as well as in the producers', if goods transported in unreturnable packing paid a lower tariff than those in returnable packing.

666 REBHOLZ, K. **Promotion of Cultivation of Vegetables.** (Förderung Gemüsebaus). — *Landwirtschaftliches Jahrbuch für Bayern*, 2. Jahrg., No. 1, pp. 1-13. München, 1912.

Germany: Bavaria

During the last ten years there has been a great development in Bavarian fruit cultivation, thanks to the Government and various organisations; but no similar advance in market garden produce can be recorded. The latter ought to be developed by the same methods as those which have been applied to the fruit industry.

At present it is suffering from the want of all technical and commercial organisation, and especially of model gardens.

Vegetables are cultivated everywhere in Bavaria, and especially in Franconia, in the Palatinate, and in the South of the Upper Palatinate.

In the Bamberg district in Upper Franconia about 11 500 tons of vegetables are produced yearly. In Lower Franconia and specially at Würzburg 1345 acres are reserved for vegetables, and most of them are under glass. In Central Franconia Nürnberg is the centre of this industry, which is worth £46 000 annually. The yearly production in the Lower Palatinate is estimated at about £51 250 and consists chiefly of new potatoes, cucumbers, onions, asparagus, and radishes.

Also in the Upper Palatinate a considerable amount of vegetables is grown. The radishes grown in the neighbourhood of Regensburg are celebrated, and are sent to all parts of Germany and abroad. The production of Swabia is chiefly in the neighbourhood of Augsburg.

In 1907 the area under vegetable cultivation in Bavaria was as follows:

	Acres
Upper Bavaria	10 480
Lower Bavaria	17 922
Palatinate	6 847
Upper Palatinate	25 587
Upper Franconia	14 291
Central »	13 355
Lower »	13 123
Swabia	7 353
Total	108 958

Between 1900 and 1907 the area under vegetable cultivation diminished by 41 503 acres, or 21.9 per cent.

Every year Germany pays for the importation of vegetables some £2 000 000; so that this branch of German agricultural production ought to be promoted by every possible means. If we reckon that each hectare yields every year 150 qls. (each acre, 6 tons) of produce, it will be found that Bavaria produces every year about 6 616 950 qls. (650 000 tons).

The average annual consumption of vegetables in the whole of Germany is 83.6 lbs. per head. In Bavaria it is much less; but it would be larger, and the inhabitants would have more healthy food, if more attention were paid to this industry.

First and foremost the cultivation of small kitchen gardens for the use of families should be improved and encouraged.

From the commercial point of view, it may be said without hesitation that the improvement of this industry is possible, indeed necessary, everywhere, while its extension is only to be recommended where climate and surroundings are favourable. In this connection we should remember the importance of internal colonisation and of turning to account heaths and peat bogs. Experiments in planting, in cultivation, and in manuring should be set on foot; associations should be formed for the sale of vegetables, and for the purchase of manures and materials for packing.

There is no lack of agricultural schools in Germany, but they ought to be more attended by market gardeners. Above all, market gardeners should form associations, and the long talked of model fruit and vegetable garden should be established, so that the fruit and vegetable industries may run on parallel lines.

667 DE NOTER, R. **The "Gobô" or Salsify of Japan (*Lappa edulis major*)** (1). (Le « Gobô » ou Salsifis du Japon). — *Le Jardin*, XXVI Année, No. 600, pp. 55-56 (1 fig.). Paris, 20 Février 1912.

France. Scotland. Japan

The "Gobô" is regarded, not as a species, but as a variety of *Lappa edulis* (*Lappa major*), a plant which is found also, under the name of "Bardane", in France, where, according to Duchesne, in different districts it is called by different names, viz., "bouillon noir", "grippe", "gloutteron", "collant", etc. It seems that in Scotland the roots and young shoots of the European *Lappa edulis* are eaten by the poor, but the Japanese variety is much choicer, great attention being paid to its cultivation.

In France M. de Noter has experimented with this plant for some years, with very satisfactory results, especially as regards the weight. In 1910 he exhibited at Cours-la-Reine a bunch of "gobô"; 30 roots weighed 28.6 lbs., and a good many of them weighed separately as much as 14 oz.

After four months at most, its roots are 15 to 18 in. long, so that it can obtain sufficient nourishment without exhausting the soil; it withstands cold and drought; it is sown between 15th June and 15th July, which allows a catch crop to be made of it; its growth is rapid, and if only regarded as a forage plant, its value is very great.

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(1) *Lappa edulis* = *Lappa major* = *Arctium majus*, the common burdock. Cf. *Index Kewensis*. *Ed.*).

Cultivation. The soil must be very deep and light, to prevent the roots fanging. The surfacc must be covered with a good layer of comparatively fresh manure. After this is worked in with spade or plough, the soil is levelled with a rake or harrow. Furrows are then traced 1 ft. 7 in. apart, in which the seed is scattered so as to form little heaps every 10 or 12 inches along the rows. The soil must be kept moist, so that the germination may proceed regularly. Watering must be increased as the plants become stronger. In November the Salsifies may be collected either entirely or partly; in the latter case they are placed in a trench till required and covered with earth and some straw on the top to protect against frost. The stems and leaves may be given to rabbits and other animals which eat them readily.

"Gobô" is prepared for the table like salsify and scorzonera (viper's grass). In order to make its slightly coarse flavour entirely disappear, it should be cooked twice in different water.

FRUIT - GROWING.

ZUCCARELLO, A. **Experiments on Forcing Grafts on American Vine Stocks by Means of the Heat of the Sun.** (Esperlenze sulla forzatura con il calore solare degli innesti su viti americane). *L'Agricoltura italiana.* Pisa, 16 Febbraio 1912. **668**

The author, whilst engaged as director of an establishment for forcing grafts on American stocks, was enabled to carry out experiments on forcing in which he utilized the heat of the sun instead of the artificial heat generally used in such establishments. Four brick-work forcing frames were built along the south eastern wall of the establishment. **Italy**

The first frame was completely filled with grafts that had not been tied. They were placed at an inclination of 60°, in alternate layers with washed sea-weed, and covered with 3 to 4 inches of the same sea-weed up to within 6 inches from the glass light.

Frame No. 2 was filled like No. 1, only moist sand was used instead of sea-weed and the grafts were tied with two strands of raphia; these also were covered with a glass light.

In Frame No. 3 the tied grafts were gathered in bundles of 25 each. They were stratified horizontally in moist sand, almost up to the edge of the frame.

Results of experiments made in the year 1909 on the forcing of American vines, utilizing the heat of the sun.

No. of Frame	Date on which the frame was filled	Number of grafts	Variety of Stock	No. of grafts per stock	Variety of scion	No. of grafts per scion	Date of binding	Date of appearance of roots.	Date of appearance of shoots	Length of shoots when planted, in inches.	Date of planting out	Percentage of successful grafts.	Percentage of successful grafts with shoots.	Percentage of grafts with roots.	No. of grafts planted out
1	March 17	2 000	Riparia × Rupestris 3309	2 000	Livese	1 000	March 29	April 4	April 1	1.2-2	April 17	82.00	74.00	13.25	820
					Bianco Alessano	1 000	March 27		March 30	1.2-2.75		84.00	77.00	13.25	840
2	March 19	2 000	Aramon × Rupestris	1 000	Primitivo	2 000	March 30	—	March 27	1.6-4	April 17	79.00	72.00	—	790
			Riparia Gloire	1 000			April 1	—				78.00	68.00	—	780
3	March 22	2 000	Aramon × Rupestris	1 500	Lombigna	2 000	April 10	—	April 5	0-2	April 24	65.00	21.00	—	975
			Riparia Gloire	500			April 14	—				63.00	17.25	—	315
4	March 24	2 000	Riparia × Rupestris 3309	2 000	Livese	1 000	April 6	—	April 2	1.2-3.2	24 Avril	76.25	64.00	—	762
					Bianco Alessano	1 000	April 4	—				77.37	68.29	—	713
														Total . . .	5 995

Frame No. 4 was filled exactly as No. 2. only it was not covered with glass. Every evening at sunset sacks containing coarse stable manure were placed over the lights of frames 1 and 2 and kept there till the next morning, thus preventing the dispersion of the heat absorbed during the day.

The table on page 950 shows the results of the experiment.

As regards the regular development of the two parts of the graft, frame No. 1 answered best.

In the frames in which sand was used, the development of the shoots was much hastened, and the production of the wound callus of the scion was rather rapid, whilst the stock proceeded very slowly.

The distribution of the temperature in the various layers in the sand-filled frames, especially in No. 2, was much less regular than in No. 1.

In the grafts placed horizontally the callus binding the graft and scion appeared much later and imperfectly. They gave the least satisfactory results.

In order to maintain, in the frames, the necessary degree of moisture, every three or four days the layer covering the grafts was sprayed with water at the same temperature as the covering. The glass lights only hastened still more the too rapid vegetation of the scions, without benefiting in any way the final result of the operation.

On the other hand it appeared that covering the frames during the night and cold days with thick matting or with sacks containing coarse stable manure, was very useful.

The author carefully collected all the data respecting the expenses from the beginning of operations up to the time when the successful grafts were planted in the nursery. From the above it is seen that the number of grafts forced by the heat of the sun was 8 000, of which 5 995 were planted in the nursery. The total expense amounted to £11.2*s.* 11*d*, and the cost of the grafts planted in the nursery was 3*s* 8 $^3/_4$ *d* per hundred, which is not a low price, especially considering that among these there were a good many that did not look very promising.

HIGGINS, J. E., HUNN, CHESTER J. and HOLT, VALENTINE S. **The Avocado in Hawaii.** — *Hawaii Agric. Exp. Station, Bulletin* No. 25, pp. 1-48. Washington, Dec. 1911. **669**

Hawaii

The avocado is a member of the family Lauraceae and is designated botanically as *Persea gratissima.* It bears many common

names, such as midshipman's butter, butter pear, vegetable marrow, palta, aguacate, alligator pear etc. It is indigenous in tropical America from Mexico to Peru. It is a tree 22 to 65 ft. high, which thrives without requiring the intense heat that is demanded by many torrid zone plants.

Four species of *Persea* have been introduced into the United States, especially in Florida and in California (1).

These are *Persea Lingue*, *P. pumila* (2), *P. indica* and *P. Meyeniana*. In India the cultivation of the avocado does not extend. In Java good avocados are rare; in the Philippines the plant does not thrive. In Hawaii where the species is successfully grown from sea level to about 700 or 800 feet elevation it was introduced in the early fifties.

The avocado may be propagated by seeds, by budding or by grafting by cuttings. In Hawaii the soil is prepared for planting an avocado orchard by thorough ploughing and harrowing. Cover crops must be planted during the wet season in practically all parts of Hawaii.

The plants used for this purpose may be any one of a number of legumes, such as cowpeas, jack beans, Mauritius, lablab or soy beans. Pigeon peas (*Cajanus indicus*) are often used as windbreaks for nursery stock. As permanent windbreaks *Eucalyptus robusta* has been found very useful.

The insect pests of the avocado are fortunately few in number, but one, the avocado mealy bug (*Pseudococcus nipae*) is very troublesome. Wood-boring beetles of the genus *Xyleborus* are frequently found injuring avocado trees; of these three species are recorded. A caterpillar (larva of *Amorbia emigratella*) has also recently been doing considerable injury.

Among the enemies of the avocado a parasitic fungus of the genus *Gloeosporium* is prevalent throughout the Hawaiian Islands and gives rise to a disease which may be called rusty blight. It is apparent chiefly on the foliage and young branches.

Analyses made at the Maine and Florida experiment stations give the following composition of the edible portion of the avocado:

	Water	Protein	Fat	Carbohydrates: Nitrogen-free extract	Carbohydrates: Crude fibre	Ash
	%	%	%	%	%	%
Maine	81.1	1 —	10.2	6.8		0.9
Florida	72.8	2.2	17.2	4.4	1.9	1.4

(1) See *B.* Aug.-Sept.-Oct. 1911, No. 2678.

(2) This species is not mentioned in the *Index Kewensis*. (*Ed.*).

Hitherto but few attempts appear to have been made for the preservation of avocados. In one successful sterilization and bottling of the fruit, these were sterilised at 150 to 156° F. for four hours, the water being sterilized the previous day at 150° F. for one hour.

The Hawaii Exp. Station made a considerable number of experiments in the marketing of avocados. Fruits were placed in Vancouver, in Chicago, New York and Washington D. C. Some varieties arrived in good condition. It seems probable that with suitable shipping facilities and a careful selection of varieties the avocado can be successfully shipped to far distant markets.

The following are some of the best trade varieties:

Chappelow. It is productive, but being an early bloomer it is sometimes caught by frost.

Pollock, moderate grower, heavy bearer.

Trapp, fairly vigorous and very productive; it ripens late, which renders it remarkable for the winter trade when very high prices are realized. A large proportion of the budded trees thus far planted in Florida consists of this sort.

The Hawaii Exp. Station has under observation many of the Hawaiian varieties, of which about 65 have been described in detail by C. J. Hunn.

The following varieties of special merit are described or mentioned: No. 149, Moanalana, Nos. 150, 145, 105, 106, 108, 111, 121, 141, 142, 143, 151, 156, 157, 158, and 224.

DE GIRONCOURT, G. **The Palmyra Palm and the Value of its Nuts.** (Le Rônier et la valeur de ses noix). — *La Geographie*, No. 1, pp. 50-52. Paris, 15 Janvier 1912. **670**

French W. Africa

Borassus flabelliformis, called the fan or Palmyra palm furnishes excellent wood in the districts of the Sudan bordering upon the zone of Upper Senegal and the Niger, which is destitute of trees with large trunks. In this district, so many of these trees have been cut down, as to cause anxiety lest the species should be exterminated. Recently, the nuts of this palm have been proved to be of industrial value.

The natives only use the pericarp of the fruit, the edible portion, which is very small and of little worth. The kernels are only eaten in the case of young fruits when they are watery or gelatinous.

On ripening, they become compact, hard, and impermeable to the mordants employed in dyeing; this, together with their light

colour, has given rise to the idea of using them as a substitute for "corosos nuts" (1). But their dirty yellow tint detracts from their value. These kernels have recently been offered in Hamburg for sale at 400 frs. (about £16) per ton. Calculating that from the several bunches of 50 kg. (110 lbs.) produced annually by a tree, about 80 kg. (176 lbs.) are fine fruit of which the third part in weight can be turned to account, it will easily be seen that the Palmyra palm is of great value in French West Africa.

Each of the round fruits contains from one to three kernels; those with only one occur im the proportion of 5 per cent, while those with two, which are much the best, form from 60 to 70 per cent of the whole.

The average weight of the dry kernels is 125 grammes (4 ½ oz.). The Government of the Colony has already granted two concessions for the collecting of these nuts, which constitute a product of the greatest interest, as a new source of income for French West Africa.

FORESTRY.

671 **Felling Trees and Blowing Stumps with Dynamite.**

Blowing Stumps with Dynamite. — *Kentucky Agricultural Experiment Station of the State University; Bull.* No. 154, pp. 19-31. Lexington, Ky., 1911.

A. T. ANDERSON. Recent Developments in Explosives. — *The Engineering and Mining Journal*, Vol. 93, No. 5, pp. 270-273. New York, February 3, 1912.

J. T. GARRETT. Dynamite for preparing Land. — *Experiment Station Record*, Vol. XXV, No. 9, p. 890. Washington, January 10, 1912.

United States

In the felling of trees or the removal of tree stumps a great deal of labour can be saved by the use of various explosives, and especially of dynamite.

Tree felling. — Trees may be felled, either by girdling them with an outer charge or by causing an explosion in their centre.

In the first case a hollow cord filled with dynamite is placed round the tree and kept in position by nails, or other means, and

(1) "Vegetable ivory": see *B.* Aug.-Sept.-Oct. 1911, No. 2714. (*Ed.*).

is fired by a fuse and cap; the tree is felled by a charge C of dynamite given by the following formula

$$C = 0.00069 \times a^3 \quad (1)$$

where C represents the weight in pounds and a the diameter of the tree in inches.

In the second case a horizontal hole in the trunk is made with an auger; in it a dynamite cartridge furnished with fuse and cap is placed and then carefully tamped. The charge C' of dynamite is given by the following formula:

$$C' = 0.000103\ a^3 \quad (2)$$

in which C' and a represent pounds and inches respectively as in formula (1).

Blowing of stumps. — The hole is bored with a wood auger at an angle of about 45 degrees, so that the charge will come under the center of the stump. The diameter of the hole is 1.6 to 2 inches. The charge is placed at the bottom of the hole, the primer put in, and carefully tamped.

If the stumps are partially decayed, of course the charge will have to be located under some firm part of the stump.

In blowing very large stumps, the whole charge should not be placed in one hole, but several holes may be bored from different sides and made to intersect under the centre of the stump. The primer is placed at the intersection of the holes and the other cartridges put in so as to touch the primer.

Only a part of the charge necessary to remove a large stump may be used at first to split it. After the stump is split the parts may be blown as separate stumps.

The amount of dynamite to be used depends on the diameter of the stump; the nature of the root system; whether the stump is green or partly decayed, and the character of the soil.

In Kentucky, two different lots of stumps were blown by the Experiment Station in the spring of 1911. One lot consisted of 102 stumps, mostly of dead oak. The other lot comprised 16 stumps, 9 of which were green (3 hackberries, 1 elm, 1 cherry, 1 maple and 3 oak).

The following are the figures concerning the first lot.

Average diameter of stumps	16 inches
Total weight of dynamite required	132 lb.
Time required for one man	51 hours
Cost of dynamite	\$ 22.85
Caps and fuse	\$ 2.35
Cost of labor, 5 days at \$ 1.50	\$ 7.50
Total cost of blowing 102 stumps	\$ 33.70
Average cost per stump	\$ 0.33

The figures of the nine green stumps of the second lot are the following:

Average diameter	22 inches
Total weight of dynamite required	48 lb.
Time required by two men	18½ hours
Total cost of blowing stumps	\$ 14.06
Average cost per stump	\$ 1.56

The diameters of the three green oak stumps measured 45, 48 and 43 in. respectively. The cost of blowing these stumps was:

Dynamite, caps and fuse	\$ 6.70
Labour	\$ 3.85
Total cost \$ 10.55, or average per stump	\$ 3.52

The amount of dynamite required to blow stumps of the same kind in the same soil does not vary directly with the diameter, but more nearly with the square of the diameter, or in other words with the area of a cross section of the stump. The cost of blowing green stumps is from two and a half to three times as great as for dead ones.

672 CLERGET, PIERRE. **Krumyria and its Forests.** (La Krumyrie et ses forêts). — *La Géographie*, No. 1, pp. 47-50. Paris, 15 Janvier 1910.

Tunis

Krumyria is one of the most distinctly defined of the natural region of Tunis; from east to west, it extends from the country of the Mogod to the Algerian frontier which, geographically, it crosses; from north to south, it stretches from the sea to the valley of the Medjerda. Wherever the forests have disappeared, erosion has worn away the superficial rocks and has given rise to

dunes. Owing to its relief and its vegetation, Krumyria belongs to the most rainy district of Tunis, that which has an annual rainfall of more than 600 mm. (23.6 inches). Owing to the abundant rain, the forests of cork-oak and of evergreen oak are magnificent. They extend over an area of 100 000 to 120 000 hectares (247 000 to 296 400 acres) and, like all the forests of Tunis are the property of the State.

The cork-oak does not grow at an altitude above 1300 m. (4264 ft), 600 to 800 m. (1 968 to 2 724 ft.) being the most favourable. The first crop of cork (virgin cork) has little elasticity and is of less value than the subsequent crops, which grow again every ten to twelve years; the virgin cork is removed when the tree reaches the age of 20 to 30 years.

The evergreen-oak only covers an area of from 8 000 to 10 000 hectares (19 760 to 24 700 acres) it is still more difficult to grow and more of a calcifuge than is the cork-oak. It especially seeks a north exposure, and is found chiefly at the bottom of valleys where the soil is deep and moist. Trees worth cutting are becoming rare.

The natives are chiefly live-stock breeders and foresters; they keep principally cattle and goats, sheep being rare.

The native cereal most grown is sorghum.

The coast is sparsely inhabited, as is also the northern slope. It is necessary to reach the district of Béja and of Souk-el-Arba, in order to see numerous farms devoted to cattle-raising and cereal-growing.

The plain of Dakla which is crossed by three streams, the Medjerda, the Melleg and the Tessa includes some of the richest soil in Tunis.

LIVE-STOCK AND BREEDING

HYGIENE.

673 **The Causation of Molteno, Picton or Winton Disease in Cattle and Horses.** — *Bulletin of the Imperial Institute*. Vol. IX, No. 4, pp. 346-351. London, 1911.

Union of S. Africa. Canada. New Zealand

This discase has affected horses and cattle for some years in the Union of S. Africa, Canada and New Zealand, inducing hepatic cirrhosis. The symptoms of the disease in the three localities is practically identical. Cattle are observed to be "unthrifty" for some time, diarrhoea often sets in and death follows in from two to four days after the first definite symptoms are observed.

It has been proved that the disease is caused by species of *Senecio*, *S. latifolius* and *S. Jacoboea*, the toxic action being due to the alkaloids in these plants.

The best remedies are:

1. Shorter rotation of crops.
2. More thorough cultivation.
3. Cutting the species of *Senecio* before the seed forms.
4. Grazing sheep on land infested with these plants.

674 GOOD, EDWIN S. and BRYANT, THOMSON R. **The Dipping of Sheep for Scabies in Tobacco Dips with and without the Addition of Flowers of Sulphur.** — *Kentucky Agricultural Experiment Station: Bull.* No. 157. Lexington, Kentucky, Sept. 1911.

United States: Kentucky

This bulletin describes an experiment which was carried out in order to determine whether or not it is necessary to use sulphur with tobacco dips in the dipping of scabby sheep, for the destruction of the scab mite.

Thirty scabby sheep were taken and carefully separated into six groups of equal size, and placed in isolated pens, with every precaution to prevent exchange of infection.

The first dipping took place on March 31st, 1910. Three groups were dipped in 0.07 % nicotine, no sulphur being used; and two groups in 0.05 % nicotine, without sulphur. One group was kept as control.

Before dipping all the hard scabs were hand dressed, being moistened with the dip which was to be used, and rubbed with corn cobs to help in softening. The sheep were submerged for two minutes, the head being ducked once on entering the vat, and again just before leaving it.

The water temperature was 105° Fahr.

On the following April 11, the sheep were re-dipped, three groups in 0.05 % nicotine, without sulphur; and two groups in 0.05 % nicotine, *plus* resublimed flowers of sulphur, at the rate of 2 % by weight of the diluted dip. The last group was kept as control, as before.

The animals were examined on May 11, and June 10, 1910, and it was found that no sheep in any of the groups — except the control — bore any mites or indications of scabies.

The conclusion is that the addition of flowers of sulphur adds nothing to the efficacy of the remedy, and the Bureau of Animal Industry after further experiments under field conditions has made a ruling, withdrawing the requirement that sulphur be added to tobacco dips, and fixing the amount of nicotine at 0.07 %.

HUTYRA, Dr. F. **Experiments on Immunisation of Swine against Plague.** (A sortéspestis elleni védôojtások kisérleti alapja). — *Köztelek.* No. 18. Budapest, March 2, 1912. **675**

The author, director of the high veterinary school of Budapest conducted some time ago several experiments to test the efficacy of vaccinating pigs with the anti-plague serum, and proved that it renders them completely immune against plague and against artificial inoculation of the same. A notice of these experiments was published in No. 35 of the *Köztelek*, 1909; since then they have been repeated with the object of proving that the preventive action of the serum produced, according to the improved method hitherto followed, is always and invariably satisfactory. **Hungary**

Following these numerous experiments carried out with the cooperation of Dr. Köves, the author publishes the results of another series of tests confirming the good results of the serum, which is already used in practice.

These experiments were made on 64 young pigs, 5 to 8 months old of the Hungarian *mangalicza* breed, all of them raised on the

same farm, and weighing on an average 23 kg. (50 lb.) each. On their arrival they were placed in highly infected sties, in which they remained until the end of the test, the chief object of which was to try four varieties of serum produced in the laboratory at different dates and from various breeds of pigs; but in the main the same method was followed, namely, repeated treatments with virus taken from infected pigs. Another object of these experiments was to ascertain whether the serum of pigs which had survived the infection, but which had not been afterwards artificially rendered immune, possessed immunising properties.

The results are summarised in the following table.

	METHOD OF TREATMENT (The animals were also exposed to natural infection)	Number of animals	Died of plague head	Died of plague %
1	8 cc. serum A + 2 cc. virus (hyp. injec.) . .	8		
2	8 cc. » B + 2 cc. » »	8		
3	8 cc. » C + 2.8 cc. » »	8		
4	8 cc. » D + 2 cc. » »	8	1	12.5
	Total . . .	32	1	3.1
	Control			
5	Untreated	8	6	75
6	2 cc. virus (hypodermic injection)	8	6	75
7	8 cc. normal serum + 2 cc. virus (hyp. injec.) .	8	7	87.5
		24	19	79.2
8	8 cc. serum from pigs that had survived the infection + 2 cc. virus (hyp. injec.)	8	4	50
	Total . . .	32	23	71.9

Inoculations were made on January 7th, 1910 and the infected pigs died between January 15 and March 3. The surviving animals remained in the sties till June 20, when they were sold and fattened, attaining at the end of March, 1911 the weight of 80 to 100 kilos (176 to 220 lb.) each. There can be no doubt as to the efficacy of the serum, considering that of the 32 pigs that were ino-

culated only one died, and this notwithstanding the simultaneous natural and artificial infection, whilst in the same time most of the 32 pigs of the control lot died of the plague.

676

BOUTAN, L. **The Buffalo Bird.** (Le Merle Buffle). — *Bulletin de la Soc. d'Etudes et Vulgarisation de la Zoologie agricole,* 10e année, N. 1, pp. 1-17. Bordeaux, Février 1912.

France

The author gives a description of the Buffalo Bird (*Acridotheres cristatellus*) which is found in fairly large numbers in Southern Asia. This bird both in its general aspect and in plumage resembles the Blackbird (*Turdus merula* L.) though it belongs to the family of Sturnidae. It lives in the neigbourhood of and in villages. It feeds on insects which it seeks on the backs of animals, chiefly of buffaloes and other cattle, which are so accustomed to the birds that they do not attempt to drive them away.

The Buffalo Bird is met with throughout Southern Asia, under such various conditions that the author believes that it could be acclimatized in the South of Europe. He advocates its introduction as a means of controlling the parasites of our cattle, especially ox-flies.

WORK OF LIVE - STOCK ASSOCIATIONS AND OTHERS FOR ENCOURAGEMENT OF BREEDING.

677

Special Railway Regulations in Germany for the Transport of Cattle in Summer. (Besondere Massnahmen der Königlichen Eisenbahnverwaltung bei Viehsendungen im Sommer). — *Zentralblatt der Preussischen Landwirtschaftskammern,* Jahrg. 11, Nr. 9, p. 61. Berlin, 26 Februar 1912.

Germany: Prussia

The hot summer of 1911 often had a bad effect on the cattle carried by railway, especially when the distance was long. To prevent this in future, the Prussian Railway Administration has issued a regulation to the effect that during the hot season the carriage of cattle is to be as rapid as possible, and that if a delay should occur through no fault of the sender or of the attendant, the cattle cars will be despatched to their destination by trains set apart for

them, without any increase of charge. The cattle are not to be packed too closely together.

Water and suitable apparatus are to be kept ready at the stations for sprinkling the cattle and the cars.

On the demand of the sender, open-work trucks, will be provided as far as possible for pigs. Long distance journeys should be effected in the night.

678 **Government Subsidies for Bulls and Boars.** (Kundmachung betreffend die Abgabe von Subventionsstieren und-Ebern). — *Landwirtschaftliche Mitteilungen für Steiermark*. 61. Jahrg. No. 5, p. 69. Graz, 1. März, 1912.

Austria

The Kaiserlich Königlich Landwirtschafts-Gesellschaft in Steiermark provide cattle for breeding in districts where no associations for this purpose exist, on receipt of a proper application. The bulls are bought by the Society where they were bred, and consigned to applicants on payment of 60 % of the price. After two years they become the property of the recipient. If the animals are not properly fed and kept, he has to pay the remaining 40 % of the price.

From its breeding stations the Society also supplies boars to its members on payment of 30 Kronen or £1 5*s*. The recipients undertake to make an entry in the register of all couplings and also to place the boars at the disposal of other owners of sows at a charge of not more than 50 heller, or 5*d*. After two years the boar become the property of the recipient.

The Society also provides on the same conditions rams of the Carinthian Zealand race on payment of 20 Kronen (16*s*).

HORSES.

679 MÜLLER. DR. MAX. **Researches upon the Functional Adaptations, and Anatomic and Physiological Differences between Light and Heavy Breeds of Horses.** (Studien über funktionelle Anpassung und über anatomische und physiologische Unterschiede zwichen warm und kaltblütigen Pferden). — *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*. Heft 189, Berlin 1911.

Germany

In the first part of his work, the writer investigates the difference between light and heavy horses (Warm- und Kaltblütern) in

regard to their lungs, heart, liver, pancreas, the amount of blood they possess, and the haemoglobin content of the latter.

The necessary investigations were carried out in the Berlin Central Slaughter House for horses, upon 48 horses of either type.

The second part of the work consists of measurements for the purpose of ascertaining the length and angles of the fore and hind legs; 49 trotting horses were investigated from the Ruhleben stud, 25 pure-bred horses from the Royal Stables at Berlin, 18 heavy dray-horses and 10 heavy horse stallions. The hind leg measurements were made in the case of the above 49 trotting horses, 51 post horses (Postpferden) and 48 heavy brewery dray-horses.

In the lung-investigations freshly killed horses were used. Weight and air capacity were measured by means of inflating the lungs to a determined manometer pressure. The average lung-weight of a light horse was 4.45 kg (limit 3.40 — 6.45 kg) and the average air capacity was 38.2 litres (limit 28.9 — 54.7). The lungs of the heavy horse had an average weight of 6.3 kg (4.55 — 7.50 kg and an average capacity of 41.5 litres (30.2 — 56.6 litres). The light horse had a lung capacity of 8.87 litres per 100 kg of live weight, the heavy horse only a lung capacity of 6.59 litres. 1 kg of lung weight represented an air capacity of 8.64 litres in the case of the light horse and 6.67 litres, in that of the heavy horse, thus we must conclude that the lungs of the light horse which have a 22.8 % larger capacity than those of the heavy breed must possess a finer texture. It is noticeable that the lung capacity of the light mare per kg of lung weight is 7 % greater than in the case of the gelding of the same breed. The exterior chest measurement gives no indication of the lung-weight. The heart was tested by the Bohr method (1), which gave the volume of actual heart muscle at 3.20 litres in the case of the light horse, and 4.10 litres for the heavy horse. The absolute maximum heart capacity in the case of the 26 light horses investigated was 3.95 litres (2) (3.20 — 5.0 litres). The average for 36 heavy horses was 4.77 litres (3.2 — 6 litres).

The heavy horses had thus, on the whole, the greater heart capacity. If, however the heart capacity is reckoned by 1 kg of heart weight, it is found that light horses have an average heart capacity of 1.18 litres, (0.90 — 1.44 litres) and heavy horses only

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(1) BOHR, *Skand. Archiv. f. Physiologie.* Bd. 22. 1909. S. 221.

(2) Owing to the pericardium being injured during dissection, not all the hearts could be examined.

1.09 litres (0.84 — 1.39 litres) per 1 kg of heart weight. When reckoned per 100 kg live weight, the heart capacity of all heavy horses was below 1 litre, being on an average 0.78 litres, while 22 of the 26 light horses tested had a heart capacity of at least 1 litre per 100 kg of live weight; on average the heart capacity was of 0.93 litres. It thus follows that heavy horses have a greater relative capacity, but a smaller heart capacity than is possessed by light horses.

If the maximum heart capacity per live weight is taken as 100 for the light horses investigated, that of the heavy horses which were tested was only 83.9.

The weight of the liver varied in light horses from 3.65 and 7 kg, that of the spleen between 0.80 and 2.20 kg. In the case of heavy horses, the weight of the liver was ascertained to be from 4.45 — 9,20 kg, and that of the spleen from 0.8 — 2.20 kg. The weight of liver and spleen was very variable, and depended greatly on nutritive conditions. On the average, in the case of the heavy horses investigated, the absolute weight of the liver was greater than that of the light horses, but reckoned per 100 kg living weight, it was less.

The amount of blood was not accurately measured, and only in the case of some of the horses. On an average, it amounted to 33.1 kg or 7.7 kg per 100 kg live weight per horse in the case of light horses.

The average result of 25 tests gave 38.0 kg of blood, or reckoned per 100 kg of live weight, 6.2 kg for the heavy horses, thus relatively less than that possessed by the light horses.

The haemoglobin content was obtained by the Plesch method, and showed considerable variation, the average in the case of the light horses being 12.4 %, in that of the heavy horses only 11 %.

The greater heart capacity per 100 kg live weight possessed by the light horse, its larger blood supply (measured in the same way) and the higher haemoglobin content of its blood, makes it possible for more oxygen to be conveyed to the tissues of the light horses, in times of maximum work than to those of the heavy one.

In measuring the fore-limbs, the two superior side extremities of the scapula were marked with chalk, and joined by a straight line divided in half, from this point of division, a line was drawn to the extremity of the knee-joint. This line is equal in length to the scapula, and it gives, in addition, the angle which the latter makes with the vertical.

The writer calls this the shoulder-angle.

A small depression in the lower end of the fore-arm, and also one on the side of the carpus are indicated by white chalk marks and the distance betwen these two points is measured.

These latter, when joined, form one, or rather, two triangles of which the angles are determined by trigonometry, and which are identical with those which the parts of the fore-limbs make with one another. In the case of the hind-legs, in addition to the length of the bones, the angles of the latter are also determined.

The average shoulder length was as follows:

	cm.
In thorough-breds	48.2
» heavy horses	47.7
» trotters	43.9

Average length of humerus (upper arm):

	cm.
In heavy horses	37.0
» light horses	35.9
» trotters	31.9

Average measure of radius and ulna (fore-arm):

	cm.
In trotters	41.6
» heavy horses	40.2
» light horses	39.6

Average of scapula angle:

In heavy stallions	41° 28'
» dray horses	39° 5'
» trotters	35° 57'
» light horses	34° 48'

Average of angle of scapula with humerus:

In trotters	97° 50'
» dray horses	89° 59'
» thorough-breds	89° 46'
» heavy breed stallions	86° 24'

Average measure of ellow-angle:

In trotters	128° 39'
» heavy breed stallions	127° 56'
» dray horses	125° 20'
» thorough-breds	124° 36'

The scapula-humerus angle of heavy draught horses was in all cases larger, and the scapula somewhat more upright, than in the case of heavy stallions, probably this difference is due to the slight shortening of the muscles in dray-horses, caused by hard work.

A special stud-book for poneys was introduced in 1902.

In 1896 prizes were instituted. They are distributed (in principle, at each meeting) by the Stud-Book Committee as follows: 2 prizes of £4; 5 prizes of £2; from 10 to 12 honourable mentions, worth 16 shillings each.

Since 1896 the purchase of these horses by neighbouring countries increased so rapidly that in 1904 the Government was obliged to put an end to a practice which was threatening to destroy all that had been gained by so much sacrifice. By the Decree of May 15, 1904 a tax of £2 is levied for every young horse exported under 4 years, and one of £3 for fillies or mares under 6 years. This notwithstanding, about 600 horses are exported every year.

CATTLE.

681 HUTTON, G. H. **Winter Beef Making out of Doors in Northwest Canada.** — *Report of Experimental Farms, Year ending March 31st, 1910,* Department of Agriculture, Ottawa.

Canada

In order to ulilize by feeding a quantity of frosted wheat having a market value of 35 cents per bushel, 19 steers, two and three years old, were purchased to be fed out of doors at the Dominion Experimental Farm, at Lacombe, Alberta. The steers were an average lot, being grades of Shorthorn, Hereford and Galloway breeds.

Twelve were put on feed December 8th, four on December 15th, and three December 23rd. making a total of nineteen head. One steer died during the test. They averaged 1,130 pounds and cost 3 ½ c. per pound, weighed on arrival. Freight charges and travelling expenses brought the cost up to 3.658 cents per pound, or $ 744.01. Grain was fed in the beginning at the rate of 3 pounds per head per day, and was gradually increased until by February 26th, they were getting 16 ½ pounds per head per day. This was practically full feed and, during warm weather, had to be reduced, as the aim was to feed only what they could clean up in an hour.

They were fed outside in the corral and had access to a shed which was seldom used. The only expense was for lumber to build hay racks, grain tables, and for a water tank and tank heater which prevented the formation of ice on the water. The total cost of time was 222 hours. The time necessary is evidence that outside

feeding may be carried on at small expense for labour as well as for equipment.

The cattle were fed 109 days during which time they made an average gain per head of 118 lbs. at a cost of \$ 7.42 per 100 lbs. The total cost of the cattle feed and labour was \$ 995.07. Even with the loss of one steer, the receipts from the sale of cattle, the hide of the lost steer and the profit of \$ 4.75 on two hogs following the cattle, amounted to \$ 1 300.45. Deducting the value of the lost steer and the food consumed by him, a profit of \$ 258.24, or of \$ 14.35 per head was secured. The transaction returned full market value for coarse fodder, etc., and \$ 1.28 per bushel for the frosted wheat. The cattle sold for \$ 5.75 per 100 lbs. live weight less 5 per cent.

GARILLET, E. **Influence of the Temperature of Drinking Water on Cows.** (Influence de la température de l'eau d'abreuvage sur les vaches). — *La Terre Vaudoise*, 4[e] Année, No. 4, pp. 46-47. Lausanne, 27 Janv. 1912. **682**

A correspondent of *La Terre Vaudoise* having asked, in a preceding number, whether the temperature of the water drunk by cows had any effect upon them, the Author answers as follows: **Switzerland**

At the Cery dairy (near Lausanne, Switzerland) the cows are watered in the feeding-troughs and do not leave the cow-house to drink. The water supplied is very cold in winter and frequently it caused a stoppage of rumination and even some cases of abortion.

In 1902 this state of things was remedied by the use of water reservoirs formed by sheet iron cylinders, which were fastened to the ceiling of the cow house, over the passages. These cylinders are connected at one end with the main water supply pipes and at the other with the feeding-troughs.

By the turning of one cock they can be filled, and by another one their content can be emptied into the feeding-troughs.

They hold enough liquid to water all the cows once. They are filled in the evening for use in the morning, and *vice versa*.

The warmth of the cow-house, about 59 to 64 ½° F., is enough to warm the water in the cylinders, so that since these reservoirs have been in use, none of the animals have suffered from the effects of the excessively cold water to which they were formerly liable.

It appears also that this new method has a favourable influence on the productions of milk; anyhow it is since the fitting

up of these reservoirs that the milk yields have increased. The average yearly milk yield per cow was:

(With reservoirs) period 1902-1911	790	gals.
(Without ») » 1895 1901	741	»
Increase . . .	49	»

This increase would probably have been even greater if it had not been for the following circumstances:

1. In 1906, 1907 and 1908, some of the cows suffered from vaginitis; they gave less milk and some of them had to be disposed of.

2. 1909 and 1910 were rainy years and the forage was not the best for the production of milk; 1911 was a dry year and the yield of milk was low.

Before the use of these cylinders the temperature of the water supply in the cow house sank sometimes as low as 37° F., whereas now it is never below that of deep springs (43° to 50° F.).

The Author concludes that these reservoirs have a two-fold advantage: diminution of accidents (stoppage of rumination and abortion), and increase in yield of milk.

683 Herter and Wilsdorf. **Loss in Weight of Fattened Cattle.** (Gewichtsverluste der Mastrinder von der Erzeugungs- bis zur Verbrauchsstelle). — *Arbeiten der Deutschen Landwirtschafts-gesellschaft*, Heft 182. Berlin, 1911.

Germany

Cattle lose in weight on their way to the slaughter-house. This loss should be calculated as exactly as possible by the owner, so that on consulting the quotations of the slaughter-houses he may be able to ascertain the real worth of his cattle.

The above work endeavours to determine the amount of this loss.

Messrs Herter and Wilsdorf asked the exhibitors in the 35th Berlin Cattle Show to give them the exact weights of the animals before they were sent to Berlin. On their being again weighed when they arrived, it was found that 25 calves had lost on an average 5.16 %, and 238 full-grown animals 5.47 %.

At the 36th Berlin Cattle Show, 1910, more exact details were obtained.

The losses in weight on the journey showed great individual differences, and did not appear to depend alone on the time involved.

Differences of age and sex, of biological and physiological condition, perhaps also of food, were doubtless the other determining factors.

The following table shows the average results obtained :

	Number	AGE	Average weight of the animals before transport Cwts.	Loss during transport, in percentage of weight	Total Railway Mileage	Railway Mileage which caused 2.2 lbs loss of weight in each animal *
Calves	42	Up to 4 ½ months .	3.33	4.2	167 ¾	23.60
Bulls	11	3 ½ years and upwards	18.77	4.5	148 ½	3.47
Cows	27	» » » »	14.34	4.9	138	3.85
Young Bulls . . .	18	Under 3 ½ years . .	17.05	5.5	159	3.10
Cows	8	From 2 ½ to 3 ½ years	12.56	5.9	204 ½	5.40
Steers	50	3 ½ years and upwards	15.69	6.1	210 ½	4.28
Heifers and Steers	43	Under 3 ½ years . .	11.68	6.5	248 ½	6.46
Steers	145	From 2 ½ to 3½ years	13.42	7.3	192	3.85
Total	344					

The animals came from all parts of Germany.

SHEEP.

Sheep-Breeding. Wool Production and Trade in Italy. (Allevamento ovino, produzione e commercio delle lane nell'Italia). Ministero di Agricoltura, Industria e Commercio: *Atti della Commissione per lo studio della produzione e del commercio delle lane in Italia*. Vol. I. — *Istituzione della Commissione; Relazione riassuntiva e verbali*, p. 106. Roma, G. Civelli, 1911. Ministero di Agric., Ind. e Comm. — *Censimento generale del bestiame* del *19 marzo 1908* (*legge del 14 luglio 1907*, No. 535), pp. LXXI + 691 + 16 tav. Roma, G. Civelli, 1911. — *Inchiesta parlamen-* 684

* 1 mile on foot was calculated as equal to 12 miles railway ; and
1 mile in a waggon » » » » 5 » »

tare sulle condizioni dei contadini nelle Provincie meridionali e nella Sicilia, Vol. II: Abruzzi e Molise, T. I; Roma 1909; Vol. IV: Campania, T. I; Roma 1909; Vol. V: Basilicata e Calabria, T. III; Roma 1910; Vol. VI: Sicilia, T. I, Roma 1910.

Italy

Sheep and Goat Breeding in Italy. — Statistical data taken from the census of March 19, 1908.

	SHEEP					Goats
	Male and female lambs of more than a year old	Rams reserved for breeding	Females	Castrated	Total	
Piedmont	71 769	6 363	165 813	8 800	252 745	149 711
Lombardy	40 252	5 550	68 980	9 649	124 431	97 940
Venetia	67 549	4 356	123 098	6 607	201 410	79 098
Liguria	48 845	3 638	139 938	1 297	193 718	48 721
Emilia	95 789	6 167	243 433	2 111	347 505	14 112
Marches and Umbria	251 737	16 321	667 082	30 767	965 909	124 571
Tuscany	243 667	20 182	851 587	10 696	1 126 132	101 204
Latium	183 248	69 536	951 863	16 015	1 220 662	112 556
S. Adriatic region	523 519	70 413	1 390 588	23 766	2 008 286	310 321
S. Mediterranean region	481 454	92 540	1 284 586	27 811	1 886 391	859 029
Sicily	186 714	41 661	704 926	21 697	958 998	311 044
Sardinia	543 901	46 082	1 278 322	8 436	1 876 741	506 566
Total . . .	2 738 244	382 809	7 874 216	167 657	11 162 926	2 714 878

In comparison with the census of 1881, there is an increase of 29.86 % in the number of sheep and of 34.65 % in that of goats. There are in Italy, on an average, 38.94 of these animals per km² (per 0.3861 sq mile) of which the maximum occur in Latium (101.04) and in Sardinia (77.84).

Amongst European countries, Italy ranks fifth in the production of sheep and goats, as is shown by the following table:

	Year to which the census refers	SHEEP			GOATS		
		Number of Sheep	Per (d) km²	Per 100 inhabitants	Number of Goats	Per km²	Per 100 inhabitants
Italy	1908	11 162 926	38.94	32.92	2 714 878	9.47	8.01
Austria	1900	2 621 026	8.73	10.27	1 019 664	3.40	3.99
Belgium	1895	83 695	2.84	1.17	257 669	8.75	3.60
Bosnia-Herzegovina	1895	981 907	19.21	73.49	1 447 049	28.31	108.303
Bulgaria	1905	8 131 004	127.54	307.49	1 384 128	21.71	52.34
Denmark	1903	876 830	22.04	35.57	38 984	0.98	1.58
France	1907	17 460 284	32.55	44.81	1 421 009	2.65	3.65
Finland	1906	919 467	2.44	32.39	5 674	0.001	0.20
Germany	1908	7 703 710	14.25	12.70	3 538 970	6.53	5.
Great-Britain	1908	27 119 730	117.63	68.07	—	—	—
Ireland	1907	4 126 106	49.24	94.07	246 286	2.93	5.61
Luxemburg	1900	8 467	3.27	3.44	11 344	4.38	4.60
Norway	1904	998 819	3.7	47.60	214 594	0.66	10.23
Netherlands	1904	606 785	18.39	11.35	165 497	5.01	3.10
Rumania	1900	5 655 444	43.16	104.61	232 515	1.77	4.30
Russia in Europe and Poland (a)	1907	No. of head 46 589 267 per; km² 9,43: per 100 inhabitants 45.30					
Spain	1908	16 119 051	31.95	82.38	3 355 404	5.65	17.14
Sweden	1907	1 021 727	2.28	19.29	65 798	0.14	1.2
Switzerland	1906	209 997	5.07	6.33	362 117	8.75	10.92
Hungary	1908	7 872 742	24.18	40.88	277 060	0.85	1.44
Argentina	1908	67 211 754	23.95	1 120.20	3 945 086	1.41	65.75
Canada	1908	2 831 404	0.29	52.71	—	—	—
United-States	1908	54 631 000	5.82	64.87	1 870 599	0.20	2.22
Japan	1907	3 949	0.01	0.008	80 901	0.21	0.17
British India (b)	1907-1908	18 033 095	3.74	6.11	25 220 509	5.22	8.54
Australia (c)	1905-1908	107 900 766	13.60	2 424.74	97 179	0.01	2.18

a) This no. of head includes the sheep and goats of N. Caucasus.

b) Without Bengal.

c New Zealand 1907; New South Wales 1907; S. Australia 1905-1906; Tasmania 1908; Victoria 1907; W. Australia 1907.

d) km² = 0.3861 mile.

Sheep Breeding in Latium. — In the Agro Romano, and in nearly the whole of Latium, the breeding of these animals is nomadic and quite primitive on the large country estates.

Of late years the breeds have greatly deteriorated on account of the dividing up of large farms, the scarcity of shepherds and consequent increase in *moscetti*, poor owners of small flocks; and also through the increased export of baled forage which has deprived the sheep of the produce of the best pastures. Sheepfolds are entirely absent in Latium, for the tenant (*mercante di campagna*) cannot afford during his short tenancies of 9 to 12 years to make sheepfolds, even in the cases where the flocks are his own property.

Nevertheless, the law for the improvement of the Roman Campagna (1) obliges owners in districts where a thin stratum of soil resting upon impermeable rock renders the ground unsuitable for other purposes than stock-raising, to build permanent masonry sheepfolds with dwellings for the shepherds and cheese dairies. In this way the cheese-making industry will at the same time be promoted.

In the district of Viterbo, that part which borders on Umbria and Tuscany is subdivided into numerous estates where intensive cultivation is practised to which is added the rearing of goats under cover, while in the south portion, where there are large estates, goat breeding is largely carried on in the open, the animals being, driven from the plains to the mountains and viceversa, according to the season, or else are migratory only during some portion of the year. The production of cheese is more important than that of wool. The travelling lectureship of Agriculture has formed a "Co-operative Society of Owners of Sheep and Goats". A co-operative for the collection and sale of wool exists in Rome and receives annually about 240 000 kg. (528 000 lbs.) of wool; another is established at Foggia which receives about 140 000 kg. (308 000 lbs.).

The products of the sheep and goats of Latium are, in order

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(1) Approved by the Royal Decree of Nov. 10, 1905, No. 67. Respecting information on wool production in the Roman Campagna and the work of the wool-staplers of Rome since the sixteenth century, and also respecting the improvement of the Roman Campagna and the laws relating thereto. See: CESARE DE CUPIS. *Le Vicende dell'Agricoltura e della Pastorizia nell'Agro Romano. L'Annona di Roma, giusta Memorie, Consuetudini e Leggi desunta da Documenti anche inediti.* pp. XI + 789. Roma, Ministero di Agric., Ind. e Comm. 1911. (*Ed.*).

of importance: milk and its derivatives (the *pecorino* cheese and *ricotta*) (1) meat and wool.

It may be considered that a sheep of average size, under ordinary conditions produces annually 6-7 kg. (13.2-15.4 lbs.) of cheese worth 10 fr. (8*s*), 2.5 to 3 kg. (5.5-6.6 lbs.) of *ricotta* worth about 2 fr. (about 1.*s* 7*d*); a lamb worth 4-5 fr. (3*s* 2*d* to 4*s*) at the age of 40 days, and 1.8 kg. (3.9 lbs.) wool worth 4-5 fr. which gives an annual yield of about 20 fr. (16s.). This considerable sum has been obtained of late years, owing to the increase in the price of cheese (due to the recent and large export of this product to the United States) and by a noticeable increase in the price of wool, meat and skins. From 1890 to 1900 the annual yield of a sheep was about 15 fr. (12*s*.) represented equally by wool, milk and meat.

The experiments of Prof. Fracchia, Director of the travelling lectureship of the Province of Rome have shown that the present type of the Latium sheep, which is not specialized, is of small size but a good walker, robust and resistant; could rapidly be improved, if the pastures were also improved, especially in the plain, and if winter and autumn pastures of red clover, and of lupin and other Leguminosae were provided.

Abruzzi and Molise. — The flocks which winter in the Roman Campagna (or Apulia) migrate in summer to the Abruzzi, where they graze on the large estates, communal properties and on the collective property of Agricultural corporations (*ville* and so called Università). Further, in the districts at the foot of the mountains and on the Abruzzi mountains the system of *compascolo* is in vogue, that is to say, that as soon as the harvest is over, the animals of all the estate owners in the district graze together on the fields, which is a great obstacle to cultural improvements. Moreover, the scarcity of artificial meadows, and the very limited culture of forage plants are important factors conducing to the instability of sheep-rearing in the Abruzzi.

The migration of flocks from the plains to the mountains in

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(1) *Ricotta* is made of the residual whey from cheese-making, it is heated to 70-75° and a little aeid whey added. (This addition usually is not made in the case of sheep *ricotta*). *Ricotta* consists of a coagulation of proteins containing fat globules. Analyses of Roman *ricotta* give the following percentage results. Water 43.27, fatty matters 33.21, proteid matters 11.73, lactose 10.42, lactic acid 0.43, ash 0.54. The yield in *ricotta* is from 8 to 10 % of the amount of milk used.

See: Prof. CARLO BESANA, *Caseificio*. Torino, U. T. E. T., 1908. (*Ed.*).

summer and back again in winter which is a very ancient custom (1) has greatly decreased of late.

In the Province of Teramo only two Communes possess animals which migrate in any quantity, (Fano Adriano with 27 000 head and Crognaleto with 23 000). In Molise, there is only one commune (Capracotta) where this system is practised and in the Province of Chieti it is non-existent, while in that of Aquila it obtains in 71 communes out of 127, and affects 448 727 animals. (The difference between this number and that returned in the census given above for the Province of Aquila, which gave a return of 278 931 sheep, is explained by the fact, that on the day of the taking of the census, the migrating animals were passing the winter in Apulia or Latium.

Campania. — There are no breeds special to this district. As a rule, and, especially in mountain districts, medium and small sized sheep predominate, on the high mountains towards the Abruzzi on the one hand, and Molise and Apulia on the other, flocks of fine sheep may be met with in summer consisting of merinos, or an allied breed.

Some long-tailed Barbary sheep pass the winter near Vesuvius and the mountains of Sarno and Avella. There are also many of similar or *bergamasco* type, large animals, hornless with arched forehead and abundant thick wool of coarse quality (suitable for mattresses). In spring, very frequently, the flocks of Avellino and Benevento descend to the plains of the valley of the Sarno and of Nola as far as the low slopes of Vesuvius. The flocks which are few in number descend browsing as they go, and eventually remain

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(1) The "Tavoliere di Puglia" was a large extent of common pasture (extending between Mt. Gargano and the sea from Molise and the Abruzzi on the north to the provinces of Bari and of Lecce in the South) of which the origin goes back to the Roman conquest of the Daunians and Peucetians. It included a vast district, which on being confiscated from its original owners, became public property, which the Treasury let to the shepherds who descended in winter from the mountains of Samnium and Lucania.

All succeeding governments until 1806 and again from 1817 to 1865 found that the rent of the *Tavoliere* constituted one of their chief sources of revenue.

The Italian law of March 23rd 1865 allows the easements to become alienable patrimony. Thereupon ensued, in Apulia, the transformation of pastures into corn land and of the latter into vineyards, olive-yards and almond plantations.

See: O. Bordiga, *Economia rurale. Parte I. I fattori della produzione agraria*, pp. 140-143. Milano, Vallardi. (*Ed.*).

in the above-mentioned districts, where pastures are bought and manure is sold. In December, the fields of lupin, which follow the barley are used as fodder, and towards Easter (after the birth of the lambs) the early crimson clover is consumed.

One hundred sheep eat in one night the grass of 500 to 700 m² (1.23 to 1.8 acres) if it is will developed, and of 450 m² (1.1 acre) only on fields manured with chemical fertilizers.

The milk is sold in its natural condition. With a flock of 100 sheep containing 80 milch ewes, from Dec. 1st to April 30th, the following products can be obtained:

	L	s	d
Milk produced in 150 days 1 452 gals at 10.82*d* per gal.	65	9	6 ¼
Dung about 7 3/4 *d* per night	4	15	2 3/4
Wool: 2.2 lb. good quality and 0.55 lb. inferior, per head; 220 lb. at 10.8*d* per lb., and 55 lb. at 7.8*d* per lb. . . .	10	10	3 3/4
Lambs, 80 at 3*s* 6.86*d* each	14	5	8 ½
Total . . . £	95	0	9 ¼

	£ s d	L	s	d
Pasturage, about 660 sq. yards per day 20.37 acres at £1.12 per acre, ...	32.14.9			
Shepherd and boy	15.17.5 ½	48	12	2 ½
Profit . . . £		46	8	6 3/4

This sum has to cover seven months' grazing on the mountains, and risks and losses.

Basilicata and Calabria. — Sheep-rearing is decreasing, contrary to what might be gathered from a comparison of the former census with the preceding one, although the figures of the latter were, in fact, very low. In Basilicata, this industry is of greater importance than in Calabria.

In the former, it is carried out extensively on small and medium scale, and on a large scale also, especially in the eastern plain district. The Moliterno cheeses are renowned and much exported. The average annual export of fine wool amounts to about 6 000 qls. (11 760 cwt.). In Calabria the principal breeding district is that of Cotrone where a special kind of cheese is produced.

The following is an example of the organization of the industry. Of a large flock of 5 000 head, 4/5 are sheep and 1/5 goats, divided into *morre* of about 300 head each. The sheep consist of 1 *morra* of sheep, 7 *morre* of milch ewes, 2 *morre* of *scavite* (ewes in their

second year which are about to be mated) 2 *morre* of female lambs, 2 *morre* of ram lambs, total 14 *morre*. Milking begins in December, the cheese is sold in the lump in July, it is weighed and delivered every ten days from the commencement of the following December. At the end it is reckoned up. The ripening of the cheese is the business of the buyer, who tries to obtain a constant type.

The flocks go to the mountains in the summer, where they graze on the communal land paying the *fida;* in winter, they descend to the plains and are pastured on rented ground (1).

Sicily. — Sheep as well as cattle are reared here on the migratory system. Cattle, sheep, and goats graze together sometimes, with the idea of turning to account the different plants in the pasture, but more often they are kept apart.

The natural pastures, in the neighbourhood of the crops, occur everywhere, but are not kept up, and are generally poor. Permanent pastures in mountain and coast districts occupy land which is not adapted to cultivation. Those on the coast, which are earlier, serve as winter grazing grounds. By the spring, they are already exhausted. and the drought prevents the grass making a new growth. The animals are then driven to the pastures of the intermediate zone, where they remain until the end of May, then they migrate to the mountains, to return in the autumn to the coast.

Improvement of Breeds of Sheep. — The Commission for the study of the production and sale of wool in Italy proposes to establish in Latium a National Sheep station for the purpose of providing an improved type of animal for breeding purposes.

In the Royal Depôt of improved breeds at Portici (Naples) there are some of the Rambouillet breed, but scarcely enough to satisfy even a small part of the local requirements. With regard to the improvement in the production of wool, it would be necessary in the case of the Apulian wools (which are good, but short) to effect crosses with the Rambouillet ram, or the merinos of Port-Philip, while the sheep of northern and central Italy as well as those of Basilicata and Calabria are best crossed with Apulian me-

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(1) In Calabria of Cosenza and Catanzaro the flocks pass the winter on the pastures of Sila, the remains of a very ancient estate of more than 100 000 ha. (more than 247 000 acres) which the Romans in A. U. C. 476. took from the conquered Bruzi. The law of May 25th 1876 assigned to the estate 3 500 ha. (8 645 acres) of unalienable forest, and left to the communes about half the land to be divided among the inhabitants. See O. BORDIGA, op. cit. (*Ed.*).

rinos, or Southdown and Dishley rams. The Dishley-merino cross is the most successful.

Very good results have been obtained at Portici by Prof. Baldassare (*Bollettino di Notizie agrarie*, Anno XIX, 1897. Febbraio, No. 5, p. 158) in crossing the Rambouillet race with the Apulian varieties locally called *sopravissane* and *gentili*.

The half-bred animals are distinguished by earlier development, a greater weight and a heavier and better fleece (valued at 2.10 fr. or 2.20 fr. per kg. (9.1 to 9.5*d* per lb.) as against 1.90-2 fr. (8.2 to 8.6*d* per lb.) for the local wool: the economic results are as follows:

Half-breeds: 3 kg. (6.6 lb.) of wool at 2.10 fr. (9.1*d*) . . .	fr.	6.30	(5 *s* 0*d*)
Local varieties: 1.67 kg. (3.7 lb.) at 2 fr. (8.6*d*).	»	3.34	(2 *s*. 8*d*)
Difference in favour of half-breeds . .	fr.	2.96	(2 *s*. 4*d*)

Equally good results were obtained by Prof. Ricco, at the Experimental Farm of Sant Alessio (Rome), in crossing the Rambouillet race with the Latium sheep, as is shown by the following table:

	kg.	lbs.
Average weight of Latium sheep of 4 ½ years .	40 =	88
» » half-bred » » » .	55 =	121
» » » lambs of 2 ½ years.	80 =	176
» » » » 1 ½ year .	55 =	121
» » » » 4 ¼ months	25 =	55
Weight of wool per Latium sheep.	2.5 =	5.5
» » » half-bred	4.0 =	8.8
» » » Rambouillet ram	7.0 =	15.4
» » » half-bred »	5.5 =	12.1
» » » Latium »	4.0 =	8.8

The Southdown sheep was introduced into Italy by the Ministry of Agriculture but the results have not been always as successful as was anticipated, being almost negative in the Abruzzi (Stock Breeding Stations of Alanno (1) and Scerni).

In Sicily (Roy. Stock Breeding Institute of Palermo) pure bred Southdowns cannot stand the climate, they get chronic intestinal catarrh and die before they are two years old, but on the other hand, South down × Sicilian are adapted to the climate and are superior to the native sheep especially as regards milk-yield.

(1) Good results were obtained at the Royal Stock Breeding Station of Alanno, Chieti, in crossing the local sheep (*pagliarola*) with the mountain breed

Italian Wools. — In Piedmont, Liguria, Venetia and Emilia sheep-rearing is neglected, the wool produced is little in quantity and of poor quality, it is used in the local manufacture of coarse cloth.

The Tuscan wools are very strong and white, but coarser than the Roman or Apulian wools. They are easily combed and give a good yield when washed. (78 % as against 58 % in the case of the Apulian wools and 65 to 68 % in that of the Roman wools).

The wools of the Abruzzi, which are the produce of sheep which live all the year in the district, are poorer in quality and yellower than those of Apulia, although they are equally good for felting. They card and comb well.

The Roman wools are divided into fine " sopravissane ", medium " sopravissane ", " lucolesi ", " vissane ", " amatriciane ", " ascolane " (" cingolane "). The fine " sopravissane " wools are the resulting of crossing Spanish merinos with Lucoli sheep, the medium sopravissane, of crossing small sopravissane rams with " vissane " ewes, and the " vissane " wools are produced by mating " sopravissane " rams with ewes from Umbria and Visso.

The latter wools are of coarser quality than those of the " sopravissane ". The "amatriciane" sheep are said to be the result of crossing the Abruzzi type with the " vissane ". The wools called ascolane and cingolane are commoner; those of Umbria and the Marches, the products of non-migratory sheep, are a little yellow, but somewhat brittle, the quantity is good, but the wool is not much liked, it is only useful for carding.

The number of sheep grazing in Latium is estimated at 2 200 000 head and the amount of wool they furnish is about 3 000 000 kg. (59 000 cwt.).

(*bergamasca*) especially as regards meat-production. Measurements of three-year old *pagliarola*:

Length of wool.	19 cm. (7.4 in.)
Thickness	28.33 μ
Live weight.	48.5 kg. (106.7 lbs.)
Live weight of three months old lamb	13.68 kg. (30 lbs.)

Measurements of half breed *bergamasca* sheep, respectively:

19.75 c.m. (7.6 in.) 30.38 μ 78.8 kg (173.4 lb.) 24.5 kg. (53.9 lbs.),

See: Dott. GIOVANNI SAVAZZINI, *Le pagliarole. Considerazioni sull'allevamenio ovino nella provincia di Chieti*, p. 28. Lanciano, 1910. (*Ed.*),

The sheep of Apulia are the results of crossing with Spanish rams of Estremadura and Catalonia, together with careful selection. The Apulian wools are the finest, whitest and most elastic in Italy and are much appreciated for combing and worsted. When combed, they can be spun as fine as 50 000 metres per kg. (about 24 620 yards to the lb.) the wools from Buenos-Ayres as fine as 70 000 metres per kg., the Australian wools are spun to 100 000 and 210 000 metres per kg. At Altamura a great trade is done in mattress wools. The wools of Basilicata are of medium type. Those of Gravina and Matera yield well and are much appreciated. The others are commoner, but long, thick, very adapted to combing and can be spun to 36 000 m. (17 726 yards per lb.). When combed, they are used for making stockings and when mixed with Roman wools they are suitable for worsted.

The Calabrian wools are of two qualities, fine and medium. The former comes from crossing merinos with local sheep, the wool is long, but the fibres are weak, and it is used for military cloth; the latter is long, fairly strong, good for combing and spins as fine as 26 000 metres (12 800 yards per lb.). It is used in the manufacture of stockings.

The wool of the Sicilian sheep is mixed with hair, and is coarse and only suitable for mattresses and coarse cloths. Each sheep produces an average of 800 to 1 200 gr. (1.76 to 2.64 lb.) of unwashed wool, which on washing loses at least half of its original weight. The price of these wools (unwashed) varies from 1 fr. to 1.30 fr. per kg. (about 4.5 to 5.6*d* per lb.). Wool is not exported from Sicily, as the supply is insufficient for the local demand. In conclusion, the Sicilian sheep, which have characteristics in common with the thin-tailed sheep of north Africa are specialised as producers of milk which made into cheese, represents an annual revenue of 8*s* per head.

The Italian Wool Industry. — The national production of woollen materials which in 1866 amounted to 12 500 000 kg. (27 500 000 lbs.) worth 74 000 000 fr. (about £2 960 000), in 1908 reached 31 900 000 kg. (70 180 000 lb.) worth 250 000 000 fr. (about £10 000 000). During this time the importation of foreign wools has also considerably increased, from 3 500 000 kg. (7 700 000 lbs.) in 1866 to 18 600 000 kg. (40 920 000 lbs.) in 1908.

From 1876 to 1908 the number of spindles increased from 248 249 to 489 786; that of machine looms from 2 571 to 10 567. The number of persons employed in the wool industry has risen from 24 930 to 38 000 as against 2 500 000 employed in England, Germany and France in the same trade.

685 Ross, F. E. **Peruvian Wools** (1). — *Peru To-Day*: Vol. III. No. 10, pp. 25-31; Lima, Jan. 1912.

Peru

The Departments of Arequipa, Puno, Cuzco, Apurimac, Ayacucho, Huancavelica, and indeed all the Peruvian uplands, produce wool. Arequipa handles 90 % of the alpaca wool exported, all the llama, and all the vicuña wool and over 95 % of sheep's wool. As regards the latter the departments of Caylloma, Ayacucho and Cuzco provide the best. The alpaca and the llama thrive in a restricted zone, not lower than 5000 feet, and are domesticated.

The vicuña is usually found at a higher elevation than the alpaca. It resists domestication, and to prevent its becoming extinct, it is protected by law, and may not be shot.

It is also forbidden to export live alpacas and vicuñas, as they invariably die. About 100 000 alpacas are clipped for their wool. This is done every two years and they then yield about 5 pounds of long wool. The grades are: fine, coarse, skin wool (from dead animals), short, and the scraps left over, which are called " locks ". The llama wool, being inferior to the alpaca, is put in a class by itself. The first two qualities are then sorted into five grades by colour. The vicuña wool costs at present 10 shillings a pound, owing to its wonderful softness, and its quality of impermeability, coupled with its scarcity.

Sheep thrive best on the table-lands, but during the rainy season they are driven down to the lower ranges, where they stay for two or three months. Judging from the known production of wool, their number may be roughly estimated at from 7 to 10 millions. The native *Sierra* sheep yield on an average 2 lbs of wool annually, and when crossed with *Merino* 3 to 4 lbs. Crossed with *Punta Arenas* they may yield as much as 6 ½ lbs. Many difficulties have been encountered in crossing pure blood animals from low countries with the native Mountain breeds, so as to combine the hardiness of the latter with the good qualities of the former. But the efforts made have now been crowned with success.

Sheep's wool is first washed (losing thereby 40 to 42 % of its weight), and then packed in sacks holding 200 lbs. It is divided into three qualities, the first being Merino, which constitutes about 8 % of the total in Arequipa. This fetches about 13 pence on the Liverpool market.

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(1) The value of wool exported in 1907 was £428 129, and in 1908 it was £297 000. See *Statesman's Year-Book*, 1911. p. 1106. (*Ed.*).

First quality comes next, good long white wool, worth about 12 pence. Second quality brings 9 pence.

There are four woollen mills in Peru: at Santa Catalina. Marangani, Lucre, and Huaro.

PIGS.

BALSTER. **Method of Fattening Pigs at Brinkum (Kr. Syke).** (Brinkumer Mastmethode). — *Mitteilungen der Vereinigung Deutscher Schweinezüchter:* 19. Jahrg., No. 3, pp. 47-50. Berlin, 1. Februar 1912. **686**

Germany

At Brinkum in the Syke district, near Bremen, there has been in the last ten years a remarkable development of the pig fattening industry, carried out not by regular breeders or landlords, but by tradesmen, working-people and petty officials, obliged to buy everything. The pigs — the improved Hanoverian race — are bought direct from breeders, or from middlemen.

Animals with broad backs, long bodies, and large bellies are preferred, because they are likely to be great eaters. And the more they consume, the sooner they can be slaughtered, and the greater the prospective gain.

The food consists exclusively of small Russian barley, ground moderately fine, and mixed with water to form a mash. More water is added in summer than in winter. To increase the appetite, and build up the bones, 50 to 60 grs. of fish-meal (with the fat removed) is given to each animal daily. It is not mixed with the barley mash, but scattered in the trough when the latter is almost consumed.

For the first 14 days straw litters are provided, but after that the pigs lie on the bare cement flooring of the sties. One quarter of the sty (at the back) is slightly lower than the other part; and this is found sufficient to keep the animals clean without straw.

If any pigs eat badly, it is better to sell them without delay. They are not only unprofitable themselves, but, if kept, reduce the total gain. When a pig weighs about 220 lbs, any further fattening is not remunerative.

If the pigs fetch a good price and the barley is not too dear, this system of fattening brings in an average profit of 10 shillings

per head. At the present moment however the situation is not very favourable, as barley has become very dear, and the selling price of the animals has fallen.

687 STEVENSON, W. **Report on Seven Experiments on the Feeding of Pigs.** — *The West of Scotland Agricultural College: Bulletin*, No. 57. *Tenth Report*, pp. 249-334. Glasgow, 1911.

Great Britain Scotland

The West of Scotland Agricultural College carried out between 1905 and 1910 seven experiments on the feeding of pigs with more than 200 animals, mostly cross-bred Yorkshires. The different lots were kept throughout the period of experiment as far as possible under the same general conditions, only they were fed on different rations. In each experiment the pigs were divided into a number of lots — 4 to 8 in each — and each lot had its own diet. Food was supplied practically *ad lib.*, and in other respects things were managed in the usual way.

Each animal was weighed at the beginning of the experiment and at intervals of 28, 28, and 21 days respectively during growth and fattening, and again at time of slaughter. Tests of the quality of the bacon from the different rations were made by qualified bacon-curers, both before and after curing, and after cooking. The foods were: barley meal, maize meal, " Paisley " meal (a by-product from maize in the preparation of " corn flour "), rice meal, wheat bran, raw and cooked potatoes, separated milk, and whey.

The cost of the different foods was calculated at their market prices; the milk products were provided by the Dairy School, Kilmarnock; separated milk was valued at 3/4 *d.* per gallon, and whey at 1/2 *d.*

The results which are given with great detail in the report, can here only be briefly summed up.

It was found possible to utilise whey profitably by feeding it alone to pigs. When fed on whey only during the last 11 or 12 weeks, the animals increased in live weight at an average rate of 1 lb. per head per day and gave a return of 1/2*d.* per gallon for the whey, and a further sum of 8*s.* 7*d.* per pig towards other expenses.

Barley meal and water, with a little wheat bran, without any dairy by-product, proved to be the least satisfactory food.

The average increase per head per day was only 0.8 lb. and the average balance only 1*s.* 2*d.* per pig.

Whey mixed with any meal was much more satisfactory.

With only one exception, whey mixed with maize meal gave greatest average increase per head per day and the best returns.

Whey and "Paisley" Meal gave a greater average increase in live weight and a better return, than whey and barley meal, with only one exception.

In three experiments separated milk and barley meal gave greater increases in live weight than whey and barley meal, and the relative values of separated milk and whey were found to be approximately as 3 : 2.

In one test with "Paisley" meal and whey it was found that warm food produced a greater increase in weight than cold food, and there was a balance of 5*s.* 4*d.* per pig left to pay for the warming of the food.

Whey with *raw* potatoes and a mixture of equal parts barley meal and maize meal gave better results both in live weight increase and in monetary return than whey with *cooked* potatoes and a similar mixture of meals.

A mixture of dry and fluid food (whey or separated milk and meal) was found to be most satisfactory, and the smallest amount of dry matter was required when maize meal was given at the rate of 2 lbs. to 2 ½ gallons of whey.

In the experiments of 1909 and 1910 the most satisfactory results were obtained from a ration of one part barley meal, one part maize meal, and eighteen parts whey, or about 1 lb. meal to 1 gallon whey. The average balance per pig, after deducting the cost of the food was 30*s.* 8*d.* The least profitable ration was obtained from a mixture of whey, barley meal, and rice meal.

Female and castrated male pigs proved of practically equal merit in producing bacon.

As the weight of the pig increased, so did the quantity of food required to produce 1 lb. live weight become greater. At 214 lbs. live weight it required 50 % more food to give the same increase than at 118 lbs. live weight, and 19 % more than the average amount required from 118 lbs. to 214 lbs. live weight.

Heavier pigs on the same diet yielded higher percentages of carcase than lighter pigs. This was partly due to the kind of food. Whey and maize meal produced the highest percentage, 71.8 %, of carcase to live weight, and of bacon to carcase weight.

Barley meal, without skim milk or whey, produced inferior bacon, while barley meal and separated milk in every test gave the best quality. When whey was used in quantity sufficient to provide a considerable proportion of the dry matter of the food, a good quality of bacon was obtained with either barley, "Paisley" or maize meal.

688 EVVARD, JOHN M. **The Brood Sow and her Litter.** — *The Breeder's Gazette*: Vol. LXI. No. 7 (1577). p. 395. Chicago, February 14, 1912.

United States

A series of fundamental brood sow investigations have been carried out at the Iowa Experiment Station. It is now realised that corn (maize) alone is not an efficient ration for a pregnant sow, so as to secure strong healthy offspring.

Thirty-five gilts were divided into seven lots with five in each lot. They were good high-grade and pure-bred Duroc Jerseys, closely related. Corn (maize) was the basis of all the rations, and it was supplemented in various lots by meat meal, mixed grains, clover hay and alfalfa. The two heaviest gaining lots farrowed on the average 8.57 pigs; the two lightest gaining 7.5 pigs, and the intermediate 7.43 pigs. This bears out the view that increase of thrift at breeding time increases the number of offspring.

The following table shows the results obtained.

Lot No.	Supplement to corn (maize) ration.	Average number in litters	Average weight of litters lbs.	Average weight per pig. lbs.	Average number of pigs saved per sow at weaning
1	None	7.6	13.20	1.74	5.2
2	1-30 meatmeal	7.4	14.89	2.01	6.2
3	4-30 meatmeal	8.8	19.62	2.23	7.0
4	Grain mixture	10.6	19.50	1.84	7.4
5	Cut clover and molasses	7.0	15.32	2.19	4.6
6	Clover in rack	6.4	14.17	2.21	5.6
7	Alfalfa in rack	7.6	17.41	2.29	6.4
Average of all		7.9	16.30	* 2.07	6.1

* Average weight of all pigs born.

The lightest and weakest pigs at birth, as well as the lightest average litter, came from Lot 1. In Lot 2, the ration 1 lb. meatmeal : 30 lbs. ear corn (maize) raised the average weight from 1.74 lbs to 2.01 lbs. The increase of meatmeal in Lot 3 raised it still further to 2.23 lbs. In Lot 4 the feed was corn (maize), oats, bran, middlings, and oilmeal in the ratio 33 : 3 : 3 : 3 : 2; the average number of pigs farrowed was 10.6 per sow, as compared with 7.6 in Lot 1, and the average weight per pig at birth was 1.84 lbs or $\frac{1}{10}$ lb. more than in Lot 1. In Lot 7 there was an increase of 32 % over Lot 1; and Lots 5 and 6 gave an increase of 20 %. Lots 4,5, and 7 were the only ones having pigs born dead, but the highest percentage was not more than 5.7.

The pigs born in Lot 1 were the weakest and thinnest of all, and the conclusion is clear. Corn (maize) is not satisfactory by itself, as it does not contain enough protein and ash to build up the bones and muscles.

HUMMEL, ALFRED. **Acorns as Food for Pigs.** (Eichelfütterung an Schweine). — *Illustrierte Landwirtschaftliche Zeitung*, 32 Jahrg., No. 18, p. 163. Berlin, 2. März, 1912. 689

Germany

On the Geeste Estate, Kr. Meppen, 5 000-6 000 pigs were fed last winter on acorns, to the amount of one-fourth of their daily ration.

Acorns contain little lime, protein, and ash; therefore these deficiencies must be carefully supplied by other food. An acorn diet alone is impossible. Twenty-five pigs were fed on acorns, at first with the addition of a small quantity of albuminous food, and afterwards for four weeks on nothing else. Their bones became soft, and in some cases brittle, and their weight decreased. The intestines were gray after death.

There were no bad effects when the acorns were given in the right proportion.

Acorns have about half the food value of maize. They are best kept in heaps, like potatoes, covered with straw and earth.

BARTOLUCCI, A. **Pig Raising and Trade in Romagna.** (Allevamento e commercio dei suini in Romagna). — *L'Italia agricola*. Anno XLIX, No. 2, pp. 33-38. Milano, 30 Gennaio 1912. 690

Italy

The general census of 19 March 1908 showed the following number of pigs in the provinces of Forlì and Ravenna:

Province of Forlì	22 724
» » Ravenna	33 700
Total . . .	56 424

Which means 31.31 head per sq. mile and 7.78 per 100 inhabitants for Forlì, and 47.13 head per sq. mile and 14.05 per 100 inhabitants for Ravenna.

Compared with the preceding census of 13-14 Feb. 1881, these figures show an increase of 94 % in Forlì and 213 % in Ravenna. In all the provinces of Emilia the average increase was 169 %, the highest in Italy.

These statistics however do not give the actual number of the animals raised; for at the time when they were made the greater part of the pigs intended for use had been killed.

The pigs of Romagna belong to the following races:

1. The original brown Romagna race (" mora " or " castagnona ");
2. The half breeds, York-Romagna;
3. The pure Yorkshires.
4. The Tuscans.

Four-fifths of the whole belong to the second class; the remaining fifth almost entirely to the first class, the pure Yorkshires and the Tuscans being a negligible quantity. The latter are not raised in Romagna, but brought there for two or three months to be fattened.

The native Romagna pig (class 1.) is derived from the Iberian Race (*Sus ibericus*) of Sanson, and there are three varieties: that of Faenza, that of Forlì, and that of Rimini, the second being by far the commonest. Dr. Ballardini in his monograph: * " On pig raising in the Faentino, " observes that the special characteristic of the brown Romagna race is the parting of very strong, thick bristles, running along the whole of the back. The York-Romagna cross-breeds mature more rapidly and are larger than the Romagna race. The former weigh when 20-22 months old as much as from 990 to 1045 lbs., the latter at 18-20 months only 550 to 660 lbs. The meat of the former, if without the excellence of the latter, is also without the defects of the pure Yorkshires. It keeps well, makes first-rate sansages, and has a fine marbling, taste, and consistence.

Pig breeding is very common among the peasants both on the *métairie* system and also for their own domestic use. The methods of feeding and fattening are as a rule rational and careful; on the other hand hygienic rules are but little regarded in the construction of the sties.

The pig trade in Romagna is very brisk: Faenza. Lugo, Ravenna, Forlì, Cesena and Rimini are the chief markets and exportation centres for the rest of Italy.

The following table gives the number of pigs forwarded in 1910 from the chief Stations of the district.

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* *Sull'Allevamento dei Suini nel Faentino* (Ravenna, 1910).

Faenza	51 141	(sucking pigs or pigs just weaned)
Forlì	17 081	(mostly fat)
Cesena	14 004	(ditto)
S. Arcangelo .	3 760	(fat.)
Savignano . .	813	(ditto)

OTHER LIVE-STOCK.

ATTINGER, Dr. **The Economic Importance of Rabbit-Breeding in Germany**. (Die wirtschaftliche Bedentung der Kaninchenzucht). *Landwirtschaftliches Jahrbuch für Bayern*, I. Jahrgang, No. 15, pp. 901-912. München, 1911. 691

Germany: Bavaria

The ever increasing scarcity of meat in Germany could be met by great attention being paid to rabbit-breeding, which has already developed considerably in France and Belgium, being practised, not only by farmers, but also by labourers and small tradesmen. Belgium sends ship-loads of rabbits to the London market. Australian wild rabbits in a frozen condition are also shipped in large numbers to London.

In Germany, rabbit-breeding does not yet play so important a part for meat purpose, as hitherto it has been chiefly of a fancy nature; but now efforts are being made to suppress this kind of breeding. Since 1902, the ministry of the Interior has given subsidies for the holding of rabbit shows and markets, and also for procuring animals for breeding purposes. Only a few races are suitable for eating — Belgian and German *Riesen* (Giant) and French *Widder* (Ram).

These animals attain a live weight of 9 to 18 or even 22 lbs. As the doe throws 6 or more young at a time, and has 4 to 6 litters a year, the offspring of an adult rabbit represent a weight of 165 to 330 lbs. Rabbits can be fed on the vegetable refuse from the kitchen, so that their keep is not costly, and when all expenses are deducted, there is a good profit, or what is of more importance, meat for the household can be otained at small cost.

In nutritive properties, rabbit flesh is equal to other meat. It contains as much protein as beef — 21 %, while in pork there is only 14 to 16 %.

To promote rabbit-breeding, the writer recommends that:

1. The edible races of rabbits should be increased.

2. Covering stations should be provided.

3. Model breeding-stations should be established.

4. Shows should be held for table-breeds, slaughtered rabbits, skins, models of hutches, etc., fancy breeds being excluded.

5. Depôts should be etablished for the Rabbit Breed societies for the sale of rabbits for the table.

6. Cooking classes should include in their curriculum the preparation of dishes made from rabbits.

7. A paper should be published dealing with rabbit-breeding.

POULTRY.

692 **Development of the Embryo Chick.** — *Poultry Advocate*, Toronto Ont. Vol. 13, No. 21, December, 1911, pp. 206, 207.

Canada

Twelve hours after incubation has begun, the ligaments of the head and body are discovered. Close observation has found the heart to beat by the close of the day. At the end of forty-eight hours two vesicles of blood are distinguished, the pulsations of which are visible. At the fiftieth hour, an auricle of the heart appears. At the end of seventy hours, the outlines of wings, and on the head two bubbles for the brain, one for the bill, and two others for the forepart and the hind part of the head appear. The liver appears toward the fifth day. At the end of one hundred and thirty-six hours, the first voluntary motion is observed. Seven hours later the lungs and stomach become visible, and the intestines, the loins and the upper jaw are seen at the end of one hundred and forty-eight hours. The seventh day, the brain, which is slimy, begins to have some consistence. At the one hundred and ninetieth hour of incubation the bill opens and the flesh appears on the breast. Four hours after that the sternum is seen, that is to say, the breast bone. At the two hundred and tenth hour, the ribs come out of the back, the bill is visible, as well as the gall-bladder. The bill becomes green at the end of two hundred and thirty-six hours. About four hours later the feathers begin to shoot out, and the skull becomes gristly. The eyes appear at the two hundred and sixty-fourth hour; and at the two hundred and eighty-eighth hour the ribs are perfect. At the three hundred and thirty-first hour the spleen draws near to the stomach, and

the lungs and the chest. At the end of three hundred and fifty-five hours, the bill frequently opens and shuts, and at the end of four hundred and fifty-one hours, or the eighteenth day, the first cry of the chick is heard.

PAECHTNER, J. Dr. med. vet. **Notes on Artificial Poultry Breeding.** (Beiträge zur künstlichen Geflügelzucht). — *Deutsche Landwirtschaftliche Presse*: 39. Jahrg. No. 12. pp. 126-127; No. 13. pp. 139-140. Berlin, 10. und 14. Februar, 1912. **698**

Dr. Paechtner has made a change in the Racine Incubator, by substituting a spirit for a petroleum lamp, in order to avoid the drawbacks of the latter; *viz.*, bad smell, and smoking. **Germany**

A spirit flame burns in a tube which passes vertically through the water basin. From the latter the warm water flows in metal tubes beneath the eggs and then returns to its starting-point. The gases from the lamp pass upwards into a space lined with tin in the upper part of the incubator, over the eggs. The tin so heated adds some warmth to the incubator, and the gases escape at the further end of the space.

The temperature is regulated by means of a vulcanite stick inside the incubator, connected with a lever, whereby the flame can be increased or diminished.

The experiments with this apparatus were satisfactory. The cost of heating worked out at about ½*d* per chicken with the incubator only half full of eggs.

Dr. Paechtner has also succeeded in measuring the temperatures which obtain when the eggs are being hatched naturally. He constructed a tin egg, and placed in it three thermo-elements; the first, close to the top of the blunt end; the second, in the middle; and the third about 1 cm., or 0.4 in., from the pointed end. The rest of the egg was filled with aluminium powder and melted paraffin, whose specific warmth is about that of egg albumen.

This egg was placed among other real ones, under a hen and afterwards under a turkeyhen, and securely fastened. The thermo-elements were connected with the measuring instruments by conducting wires.

With the hen the tin egg showed temperatures of 38°-39° C. (100.4°-102.2° F.), and in the intervals, when she left the nest, the lowest temperature marked was 30.05° C. (86.09° F.). With the turkey-hen the temperature of the tin egg varied from 35.28° C. (95.5° F.) to 39.08° C. (102.34° F.), and twice, while she was away,

the temperatures marked 21°.14° C. (70.05° F.) and 24.24° C. (75.63° F.).

The experiments showed also that the temperatures of hens' eggs, while the hen is sitting, depend on their position whether they are on the edge or in the middle of the nest; and that the hen makes constant efforts with her feet to change the position of the eggs. A transient lowering of the temperature down to 21° C. (69.8° F.) does no harm. All the fertilised eggs under the turkey-hen were hatched.

694 **Central Egg Depot for London.** — *The Dairy*, Vol. XXIV, No. 278, p. 49. London, February 17, 1912.

The National Poultry Organisation Society has opened a central depôt for eggs in Hosier's Lane, West Smithfield.

England Great Britain

For about a dozen years the society, which is a co-operative association run by farmers, has collected eggs from all parts of the country, and acted as a distributing agency between the farmers and retailers.

With the increase of business the establishment of a London clearing house was felt to be essential. The new building is equipped with all the latest appliances for testing and grading the eggs, and the system employed makes it practically impossible for the retailers to receive any suspicious qualities.

Its supplies are drawn chiefly from Cornwall, Devon, Somerset, Dorset, Hants, Oxford, Hereford, Norfolk, and North and South Wales.

695 EDWARDS, S. F. **Tuberculosis of Fowls.** *Bulletin No. 193, Ontario Agricultural College, Department of Agriculture*, Toronto, Canada, November, 1911.

This illustrated Bulletin of 20 pages has been prepared for the purpose of spreading information about the disease of tuberculosis in fowls and giving suggestions for its control.

Canada

Losses of fowls from the disease are said to be serious. One farmer is reported to have lost fifty fowls in seven months, each of two others had lost one hundred in two years.

The disease is known to affect chickens, ducks, geese, doves, canaries and parrots as well as many species of wild birds. It is known to be transmitted through eggs, but the disease is most commonly spread from bird to bird and from flock to flock through the medium of diseased birds scattering infected excreta.

By the aid of photo-engravings a clear and full description of ante-mortem and post-mortem symptoms of the disease are given. Ante-mortem sypmtoms are emaciation, paleness of the comb, etc. diarrhoea (occasionally) and lameness. The appetite remains good. Post-mortem appearances are yellow, rounded tubercles on the liver, spleen, intestinal system and lungs, and occasionally other organs and the bones. Clear instructions are given for conducting a post-mortem examination.

Curative treatment is discouraged. The quickest and most effective method of dealing with a diseased flock is said to be to kill off all the birds, disinfect the premises as thoroughly as possible and start with a new stock from a flock that is known to be free from disease. Eggs for hatching should be secured from stock that is known to be healthy. Chicks should be kept entirely separate from old fowls and only upon clean ground. It is further recommended that precautions be taken to prevent the possible infection of the fowls from bovine sources by the feeding of offal from slaughtered tubercular cattle or hogs, or from human sources by picking up sputum carelessly expectorated on the ground by consumptive persons. Explicit directions are given for the disinfection of poultry houses and yards.

BEES.

LEES, FREDERIC. **Apiculture in Algeria.** — (L'Apiculture en Algérie). — *L'Apiculteur*, 56e Année, No. 2, pp. 42-49. Paris, Février 1912. **696**

Algeria is an ideal country for bee-keeping; the climate is excellent. On the coast the temperature very rarely falls below zero, while it varies in summer between 25° C and 35° C; there are many flowers and the bees can work nearly the whole year. **Algeria**

The districts of Algeria are not all, however, so well suited to this industry. The professional bee-keeper establishes himself, by preference, on the plains and in the valleys of the coast near the geraniums, the oranges, the eucalyptus groves and the thickets rich in heaths and rosemary. He avoids the vineyards and the cereal-regions.

The bees kept, in Algeria are of the common black variety, which is very prolific and swarms frequently. The natives use the most elementary apparatus.

The hive is made either of a piece of cork-oak bark 20 or 30 cm. (8 to 12 in.) in diameter and 1.20 m. (about 4 ft.) long, or of small frames made of little round pieces of fennel stalk, joined to each other by small rods of wood. The hives made of fennel are of the same dimensions as those made of cork-bark. In some places, hives are made of pottery and also of plaited straw rounded in the shape of a pear.

The swarms or hives bought from the natives cost from 2 to 5 fr. (1*s* 7*d* to 4*s*) in the Arab district, and from 5 to 10 fr. (4*s* to 8*s*) in Kabylia.

The honey is much prized by the natives, who prefer it to sugar, and attribute to it great medicinal virtues; it therefore fetches a high price in Algeria, 1.10 fr. per kilo (5*d* per lb.) wholesale, and 2 to 3 fr. (8 ½*d* to 1*s* per lb.) retail. The colony also imports 459 700 kg. (452 tons) of honey, of which 127 043 kg. (125 tons) are for Algiers; the total amount imported is worth 354 000 fr. (£14 000).

The annual export of wax amounts to 168 quintals (329 cwt.) which is sold in Europe at 300 fr. per quintal (£6 per cwt.). There are in Algeria 1 132 European and 24 693 native bee-keepers who possess respectively 12 637 and 206 617 hives. The amount of honey gathered by the two classes of workers is 59 112 and 748 742 kg. (1 161 cwt. and 14 707 cwt.) respectively, and that of wax 6 282 and 103 731 kg. (123 cwt. and 2 037 cwt.). The average production of a hive owned by a native varies, according to the district, from 2 to 5 kg. (4 ½ to 11 lbs.), and a hive belonging to a European yields 10 kg. (22 lbs.). The native methods of taking the honey and of treating the bees are very primitive. The Governor General, with the help of the Algerian Society of Agriculture, is trying to improve the condition of this industry. Model hives have therefore been placed in various districts and entrusted to an instructor, an agent of the commune and also to a private individual. In the future, other hives will be established and entrusted to instructors who will give short courses of instruction in practical apiculture. These teachers will be instructed in the native section of the Normal School, when they will attend a short course ou Apiculture, which will enable them in the future to manage, in a competent manner, a small hive belonging to the school where they may be afterwards employed.

LOVELL, J. H. **The Colour Sense of the Honey Bee. The Pollination of Green Flowers.** — *The American Naturalist*, Vol. XLVI, No. 542, pp. 83-107. New York, February 1912. **697**

United States

This interesting paper proves by means of a series of experiments, that Plateau's (1) hypothesis regarding the attraction possessed by green and dull-coloured flowers for insects is improbable. He considers that insects find such flowers as easily as they do more brilliantly coloured blossoms; and enumerates in support of his view 91 entomophilous species, of which 41 had greenish or brownish flowers. But of these, bees only visited 27, four were not visited at all and the rest chiefly by flies. A few instances occurred of greenish flowers being visited by a large number of insects, but this was due to the large secretion of nectar on the part of the former, but the majority of species are evidently not adapted to entomophily.

This conclusion is sustained by an examination of the green flowers of eastern North America; and in New Zealand, where the flora is strikingly deficient in brightly coloured blossoms, there is a scarcity of anthophilous insects; this is also due to the fact that the flowers are scentless, however.

The phylogenetic history of green flowers supports the view that they are not well adapted to pollination by insects; probably all greenish, inconspicuous flowers have been derived by retrogression from larger entomophilous ancestors, and inconspicuous flowers are almost invariably self-fertilising. Thus Plateau's conclusion is not sustained by the phylogeny and distribution, or by the ecology and manner of fertilization of such flowers. Iu the few exceptional cases, it is odour or nectar which attracts the insects.

Experiments were made to test the colour sense of the honey bee. It was found that the bees were attracted sooner by honey placed on a blue side, than on a green dandelion leaf; they also found honey associated with bright coloration sooner than free honey. A yellow flower and an apple leaf were also tried, but the bees were not even attracted by the scent of the honey on the leaf. Plateau put honey on the green inflorescences of several species of *chenopodium* and other anemophilous flowers, and asserted that the insect visitors were attracted by odour, and that colour contrast is of little value; it must however be noted, that he made no control

(1) PLATEAU F. Comment les fleurs attirent les insectes, 4me partie. *Bull. Acad. Roy Belgique*, 3me Série, 34, 614-615. 1897.

experiments. These would have shown that, though the scent of the honey drew the insects to the green flower, the latter would have been at a disadvantage in the presence of brightly coloured blossoms. That odour alone does not attract bees, is well shown by an experiment, where the bees neglected a large mass of honey placed on a leaf and visible at a distance of 20 ft., but sought out a flower of *Impatiens Sultani* an inch in diameter, on which was a small amount of honey, notwithstanding that it was placed twelve inches from the honey on the leaf.

Thus the conclusion that green flowers are at a disadvantage in attracting insects because of their colour was fully sustained by a long series of experiments. Black and Italian bees were used, and the observations extended over portions of three seasons.

If bees are guided by the sense of vision as well as by that of smell, their present and past relations to green flowers are not difficult to understand.

Conclusion.

Green flowers are not well adapted to entomophily, and many species, possibly all, have been derived by retrogression and degeneration from larger and more highly developed entomophilous forms. They are usually small, or even minute, and are often incomplete, while anemophily and autogamy prevail.

Entomophilous green flowers, are as a whole, sparingly visited by insects belonging to the less specialized families, and as a rule, retain the power of self-fertilization. The fact that insects have been observed feeding on over-ripe, or decaying fruit, on the glandular secretions of the vegetative organs of plants, or the excretions of aphididae on foliage or greenish or brownish flowers, affords no evidence that conspicuousness is not an advantage to entomophilous flowers. Any surface, whether it is bright or dull-coloured, on which there is nectar or honey will be freely visited by bees after these liquids have once been discovered, but they will not be found as quickly on a surface which does not contrast in hue with its surroundings, as on one which does so contrast.

Experiments and observations made on green or greenish flowers in the absence of control or comparative observations are fallacious. When honey bees are given the choice between a conspicuous and inconspicuous object under similar conditions, they exhibit a preference for the former. This preference is sufficiently marked to account for the development of colour contrast in flowers.

FISH.

BERR-BAYERSOIEN, MICHAEL. **Pike Breeding.** (Der Hecht und seine Zucht). — *Allgemeine Fischerei-Zeitung*, XXXVII Jahrg., No. 5, pp. 123-126. München, 1. März, 1912, 698

About 15 years ago the writer began to breed pike (*Esox lucius*) artificially, using the system employed for the *Salmonidae*. At first he was unsuccessful, partly in the process of "stripping" the eggs, partly because the fry when hatched devoured one another through want of food. The system he has now adopted as giving satisfactory results is as follows: Germany

At spawning time, in March, the pike are caught, and put in small shallow spawning-pools well over-grown with grass. The milters and spawners which were caught together are not to be separated in the pools. The spawning is finished in 2-3 days, and then the fish are removed from the pools, care being taken not to disturb the water, as otherwise the eggs might be injured. The eggs are hatched in from 10 to 16 days, according to the kind of weather. Twènty-four hours after hatching they feed on plankton, and on the fourth or fifth day they begin to prey on other creatures. If they find none, all the weaker fry perish. To prevent this, a sufficient amount of perch spawn is collected, and placed in the pike pools. Before this is all consumed, the pike fry must be removed and placed in rivers or ponds, preferably where the water is still and overgrown with grass.

THIENEMANN, AUGUST. **Pisciculture in the Reservoirs formed by Barrages in the Valleys of Western Westphalia.** (Hydrobiologische u. fischereiliche Untersuchungen an den Westfälischen Talsperren). — *Landwirtschaftliche Jahrbücher*, XLI. Bd., Heft 3-4, pp. 535-716. Berlin, 1911. 699

The Wetphalian reservoirs are formed by the barrage of brooks in which *Salmonidae* live. The capacity of these reservoirs lies between 0.45 to 130 million cub. metres (0.58 to 169 million cub. yards). They have been made either for regulating the flow of the water, or to provide towns with drinking water, or for the production of electrical power, and in some cases for two or all three of the above purposes. Germany

Their utilization as fish ponds is a secondary consideration. From this point of view a barrage reservoir differs greatly from a lake in that its water-level is subject to very considerable changes. Besides which, it never forms that area of shallow water, such as is produced near the shore of a lake by the erosive action of the waves always acting at the same level. The flora and fauna of the shallows of a lake, which afford such an important supply of food for the fish, appear only to a very limited extent in reservoirs.

The considerable changes in the water level, on the other hand, which leave every year a large portion of the bottom exposed to the action of the air, heat. rain etc., and thus allow the growth of land plants upon it, produce, when the water level rises again, such a quantity of food for the fish, as to counterbalance the want of a permanent shallow zone.

The reservoir water, in summer, gets warmer, and to a greater depth, than lake water; this is due to the constant outflow from the lower and colder part of the reservoir, which causes the gradual sinking of the upper and warmer layers of water. The Author in September 1910 observed, in a reservoir, a temperature of 14.1° C. (57.4° F.) at a depth of 19 metres (62 feet) and at the same time in one of the crater lakes in the Eiffel only 6.1° C. (43° F.) at a depth of 20 metres (65 feet).

The principal food of the reservoir fish is furnished by larvae of the *Tendipes* species, which live in reservoirs in great numbers, far superior to those of any other species. In some reservoirs many *Daphnidae* also are found.

The amount of fish taken in these reservoirs has been hitherto rather low, about 2 to 14 lb. per year and per acre of surface. The cause of this is not that the fish do not find favourable conditions of life in the reservoirs, but that the difficulties of fishing are considerable. According to the Author the only remedy would consist in fishing as it is practised in lakes, and especially in the adoption of drag-nets. Wherever they have been tried they have given good results, but they can only be used where the bottom of the reservoir is fairly even, free from rocks, or snags etc.

The author therefore strongly recommends, that during the construction of the reservoir certain portions of its bottom should be freed from all obstacles which might prevent the use of drag-nets. These spots should be marked so as to be easily recognized by the fishermen.

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS.

ROSE, PHILIP S. **The Motor in the Field.** — *The Country Gentleman*, Vol. LXXVII, No. 5, pp. 2-3 and 27-28. Philadelphia, February 3, 1912. **700**

United States

There are over 6 000 000 farms in the United States at present, of which 1 151 488 contain more than 175 acres each. Of this number 174 487 contain more than 500 acres.

There are at least 500 000 farms that contain 320 acres and more. Each of these is large enough to find it economical to use a tractor instead of horses. The number of traction ploughing engines in active operation in the United States is estimated at about 30 000.

There are 477 488 800 acres of improved land in the United States, which require at least 40 000 million horse power hours of work. To accomplish this work there are kept about 22 million adult horses and mules.

The annual expense for each animal is not less than $ 65 a head, or a total of about $ 1 400 million dollars annually. These animals consume the crops grown on approximately one hundred million acres of land, representing more than 20 % of the cultivated land of the nation.

By the wide-spread use of mechanical power a large part of this one hundred million acres could be turned to the production of human food.

Recent statistics show that the cost of horse labour is about eight cents an hour and man labour about eleven cents. A horse can perform on an average about eight-tenths of a horse-power of work. The cost of a horse-power hour is therefore ten cents.

A man can do one-eighth of a horse-power of work and consequently a man's labour costs eighty cents per horse-power hour. A good gas tractor, on the other hand, with fuel at 20 cents a gallon

will deliver a horse-power hour for from two to two and a half cents. On this showing it would appear that the argument is all in favour of mechanical power.

Recently, near Beach, North Dakota, two thousand acres of raw prairie were broken, and seeded to flax, the crop harvested and hauled to market, all with a gas tractor. The farmer cleared \$ 28 000 for his season's work after paying all expenses, which, including the cost of equipment, amounted to only \$ 5.50 an acre, whilst, according to accurate data for a number of years, in the state of Minnesota, the cost of production of flax by horse farming ranges from \$ 6.14 to \$ 9.26 an acre on old well-tilled land.

In Minnesota Mr. James Hardy investigated the fuel cost of ploughing, disking, seeding and threshing. He broke 240 acres of sod last year and ploughed 1 685 acres of stubble land, using two and a half gallons of kerosene an acre, which cost him 8.7 cents a gallon. He also threshed for fourteen days and his best run was 3 700 bushels. When threshing he used 45 gals. of kerosene per day.

Mr. Hardy also used his tractor for a considerable amount of general road work, but gave no figures on the cost of such work.

In Kansas, Mr. M. W. Oliphant who farms 1 400 acres of land, ploughed it all at the rate of 46 acres a day with a steam ploughing outfit. It required 3 500 pounds of fuel a day, worth \$ 3.30 a ton. His engine hauled twenty-one disk ploughs, cutting a strip eighteen feet six inches wide to a depth of six inches. The cost of this work, including fuel and labour but not counting interest or depreciation, amounted to only thirty-five cents an acre.

The Judith Basin (Montana) five years ago was a cattle breeding country; now, thanks to engine farming the land is worth from \$ 25 to \$ 75 an acre. Throughout Western Canada we find similar conditions and it is largely due to the farm tractor that the three western provinces increased their annual production of wheat from 23 456 000 to 180 000 000 bushels in the last decade.

The gas tractor is superseding the steam tractor because it is lighter in weight, easier to handle, requires fewer men and as a rule is cheaper to operate. By using two crews the farmer can work his engine twenty four hours a day, a practice which is not at all uncommon on large grain farms in the West.

RINGELMANN, MAX. **The Watering of Manure.** (L'arrosage du fumier). — *Journal d'Agriculture pratique*, 76ᵉ Année, T. I, No. 6, pp. 179-182. Paris, 8 Février 1912. **701**

France

In the preparation of good farmyard manure frequent waterings with liquid manure are necessary.

This wetting reawakens the fermentation, favours the development of bacteria, and prevents the loss of carbonate of ammonia.

The liquid manure must be lifted to about three fect above the level of the top of the dung heap, and thence distributed on it by sprinkling. This can be done in three ways:

1st method. — By means of chutes consisting of two boards joined, at right angles to each other, so as to form a channel having a V-shaped cross-section. Under the lower end of the chutes some faggots are laid on the dungheap; one man is sufficient to attend to the work. Every ten minutes or so, he stops the pump, and shifts the position of the lower end of the chutes, which are supported on light wooden trestles shaped like an X or an H.

The following arrangement may also be adopted. The liquid manure is raised to a point above the centre of the heap and thence flows into a single chute, the boards of which are pierced by numerous holes. The end further from the centre is borne by a trestle mounted on two small wheels so that it can describe a circle round the centre. A screw allows this end to be raised or lowered in order to give the liquid manure more or less fall. The whole system, pump and chute, may be worked by a motor.

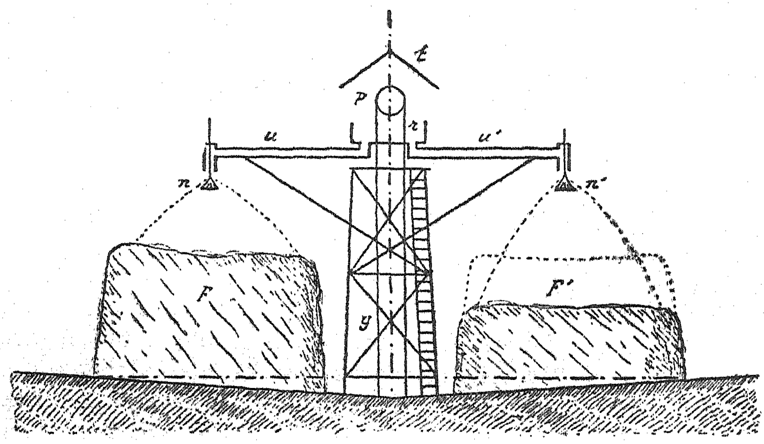
2nd method. — Between the two heaps F and F^1 (fig. 1), on a pillar of a convenient height, a chain pump P is placed; it raises the liquid manure and pours it into two pipes u and u^1 which convey it over the centres of the heaps. The pipes are fitted with taps or with conical wooden plugs sheathed with leather and their outflow is situated over grooved distributing cones n, n' which can be raised or lowered so as to be at least 6 ft. 6 in. above the heap when used. A roof t shelters the pump and its reservoir r.

3rd method. — An interesting installation has recently been made by M. Lazard at his farm at Moisan (Seine-et-Oise). The general arrangement in shown in fig. 1. But the cones n and n' are substituted by cast iron basins revolving round an axis borne by the frame work of a shed which shelters the whole installation. From each of these basins the liquid manure flows into a perforated chute, the further extremity of which is borne by a small truck running on a circular rail fixed at a convenient height to the

shed timbers. The whole is worked by an electrical 2 ½ H. P. motor.

The above mentioned installations may be utilized when it is required to produce an extra quantity of manure by frequently treating straw, sawdust, potato haulms, earth, etc., with concentrated liquid manure.

The use of a hydraulic tourniquet or Barker's mill in the centre of the dung-heap, and connected with the pump by India rubber hose is not to be recommended, as it is liable to frequent obstruction by the solid matter held in suspension by the liquid (1).



702 BERGER. **A New Separator.** (Une nouvelle écrémeuse): — *L'Outillage agricole*, II série, No. 1, pp. 183-184. Enghien, Janvier, 1912.

A new separator is the "Dalia" of the Alpha Laval type (2). Its novel features are the following:

France 1. *Oil bath.* — This is complete for all the rapidly moving parts; it is so arranged as to require a minimum of care while ensuring the greatest regularity of lubrification.

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(1) See *B.* Feb. 1912, No. 387. (*Ed.*).

(2) The "Alpha-Laval" separator was invented in 1878 by the Swedish engineer Laval; it was improved in 1889 by Bechtolsheim. At present the hand-worked sizes separate from 60 to 600 litres (13.2 to 132 gals) per hour. Motor driven sizes separate from 700 to 2000 litres (154 to 440 gals). There is also a type worked directly by steam, called the turbine separator which turns out 300 to 2000 litres (66 to 440 gals) per hour. See CH. MARTIN, *Laiterie, Encyclopédie agricole*, pp. 124-128. Paris 1908. (*Ed.*).

The clutch of the handle. — The ratchet of the clutch is on the worm wheel shaft. The result is that this shaft, its pinion, the driving wheel, the crank and its shaft stand still while the bowl finishes its rotation at the end of the operation.

3. *The bowl.* This is the new Alpha bowl with some important modifications:

a) The device for removing the disks not only allows this to be done very easily, but it leaves the last disk free, without any danger of its falling out of place when the whole is placed on the table.

b) In all known separators the cream on leaving the bowl is projected in a direct stream against a metallic surface which causes a division of the fat globules. Cream thus obtained offers a greater resistance to churning. In the new machine, the cream outlet is pierced in the side of the bowl, but its direction is oblique to the radius of the latter, and turned backwards, so that the cream cannot strike the metal surface except at a tangent. This is the most important improvement in the machine.

The other improvements render the whole separator more solid, make it easier to work and give the cream a greater uniformity of composition.

RURAL ECONOMICS.

Tenant Farmers and Changes in the Ownership of their Holdings, in England and Wales. — *The Journal of the Board of Agriculture*, Vol. XVII, No. 11, pp. 921-926. London, February 1912. 708

The Departmental Committee appointed by the President of the Board of Agriculture and Fisheries in March 1911, to inquire into the position of tenant farmers, in England and Wales, on the occasion of any change in the ownership of their holdings,— whether by reason of the death of the landlord, the sale of land or otherwise,—has presented its report.

Great Britain England

Estates on the Market. The Committee state that there is no doubt that an abnormal number of estates are being broken up

and sold at the present time. In 1911 the value of the agricultural land sold exceeded two million pounds. Among the causes to which this sale of estates was ascribed by the Committee are: 1. The feeling of apprehension among landowners as to the probable tendency of legislation and taxation in regard to land.

2. The fact that in certain parts of the country land is, at present, let at rents below its present economic value.

3. Many agricultural estates are mortgaged more or less heavily, and, at present prices, a sale will often enable the vendor to pay off the mortgages and to retain an income in excess of what he has been receiving as owner of the land.

4. Many owners finding they are now in a position to sell to advantage, are relieving themselves of the heavy responsibilities entailed by the ownership of land.

Position of tenant Farmers on Occasion of Sale. Great anxiety exists among tenant farmers as regards the sale of the estates, and this feeling of insecurity is militating against agriculture.

The Committee make therefore the following recommendations:

1. At present the tenant is under an obligation to give notice in writing of his intention to claim compensation, within two months of his receiving notice to quit, or being refused a renewal of the tenancy. The Committee are of opinion that the landlord would be sufficiently safeguarded, if the tenant were allowed to give notice of his intention to claim, at any time up to a date two months before the determination of the tenancy.

2. That for the determination of the tenancy of an agricultural holding, in absence of agreement, two years' notice should be substituted for the one years' notice.

3. That, except when notice to quit is given for one of the purposes referred to in Section 23 of the Agricultural Holdings Act, 1908, or where the tenancy is for a period of twelve months or less, any agreement for notice to quit for less than twelve months should be made void by statute.

4. That, in cases where a tenant receives notice to quit for the purpose of sale, the tenant should be empowered to serve a counter notice, claiming that the notice to quit shall not take effect, until one year after the original notice would have expired. The Committee think that a tenant would thus be given time to negotiate with his new landlord, or to make arrangements for obtaining another farm, and that this would go far towards removing any grievance under which the tenant labours at present.

5. That the Small Holdings Act 1910 should be amended to provide for payment of compensation for disturbance, in all cases

where land is actually acquired for small holdings in addition to those cases where the tenancy is determined by a notice to quit given by the council or by a landlord at the request of the council.

6) That if special legislation be enacted for Wales, effect should be given to certain recommendations of the Welsh Land Commission as to compensation for improvements.

7. State-Aided Purchase. That a scheme of State-aided purchase should be instituted providing for the establishment of a Land Bank or Institution to lend money to the farmer, to enable him to purchase his holding. The institution should lend to the farmer four-fifths of the money, to be repaid by annual instalments spread over a period of 75 years.

8. State Purchase. In view of the experience of the Small Holdings Act and the strong desire which undoubtedly exists amongst farmers that they should remain tenants, the Committee are of opinion that landed estates should be purchased and managed by the State, the farmers in this case being the tenants of the State.

RITTER. **Consultations on the Management of Estates Undertaken by the "Deutsche Landwirtschafts-Gesellschaft".** (Ein Rückblick auf die bisherige Wirtschaftsberatungen der D. L. G.). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Stück 6. Berlin, 10. Februar 1912. **704**

Germany

Consultations on the management of estates have formed part of the work of the Deutsche Landwirtschafts-Gesellschaft since 1900, but a special Board for this purpose has only been in existence for the last six years.

From 1900 to 1911 there were 146 consultations, and of this number 105, or 72 %, were applications from people personally managing their property.

The following table shows the average cost of consultation for 105 estates where the full charges were paid.

(a) *I Period. 1900-1905.*

Classes according to size, acres	Number of estates	Total area. acres	Total cost. £ s. d.	Cost per acre s. d.
Up to 250	3	525	31 6 2	1 2 3/4
250 to 500	4	1 413	30 9 3	0 5 1/2
500 to 1000	7	4 581	62 19 6	0 3 1/2
1000 to 1500	2	2 039	19 14 9	0 2 1/2
1500 to 2000	3	5 174	51 15 3	0 2 1/2
2000 to 2500	3	6 807	57 7 9	0 2
Above 2500	3	13 025	48 13 6	0 1
Totals and averages	25	33 565	302 6 2	0 2

(b) *II Period, 1906-1911.*

Up to 250	2	210	13 14 0	1 4
250 to 500	17	6 352	164 0 9	0 6 ¼
500 to 1000	22	15 613	305 0 4	0 5
1000 to 1500	13	15 119	218 4 6	0 3 3/4
1500 to 2000	9	15 571	137 3 3	0 2 ¼
2000 to 2500	7	15 215	136 16 0	0 2 ¼
Above 2500	10	47 675	315 16 9	0 1 ½
Totals and averages .	80	115 758	1290 15 7	0 2 3/4

For the whole 12 years 1900-1911 the average cost per acre works out at 2.37d. for a total area of 149 324 acres.

The Deutsche Landwirtschafts-Gesellschaft counts 18 000 members, and in comparison the number of consultations may seem small. The second period however shows a marked increase in acreage over the first. This shows that farmers are beginning to understand the value of a critical study of estate management drawn up by technical experts.

Mr. Ritter suggests that the most effective means of making known the work of the consultation board would be the figures indicating the returns obtained on those estates (without mentioning any names), where changes in management were carried out in accordance with the consultations that were applied for. To make this feasible, however, the Board would have to exercise a certain control over the consultation and its results.

The accounts of a farm with distillery attached showed for the year 1906-7 a net loss of 1*s*. 2 ½*d*. per acre. Changes were made according to the advice of an expert, with the result that for the year 1910-11 the net profit per acre was 12*s* 1 ½*d*. The chief changes were those relating to draught and other cattle, the division of the poorer soil from the richer, with two different rotations, and the choice and application of chemical fertilisers.

705 VIGIANI D. **The Production of Seeds, from the Economical Point of View.** Paper read at the ordinary meeting of Feb. 4, 1912 of the Academy of the Georgofili. (La produzione dei semi considerata dal lato economico. Comunicazione fatta all'Accademia dei Georgofili nell'adunanza ordinaria del 4 Febbraio 1912). — *L'Agricoltura italiana*; Pisa, 29 Febbraio 1912.

Italy

The Author gives some data on the profit which may be obtained by the production of seed wheat and of clover seeds, taking as a basis the results afforded by the Capezzine Estate belonging tothe Vegni

Agricultural Institute, Prov. of Arezzo where for the last ten years and more several hundred quintals of seed wheat is produced every year.

At the Vegni Institute, the system of *systematic selection* is the one adopted, as being, industrially, the most suitable for an agricultural exploitation. The various operations have been carried out as follows, for a good many years: Before the harvest, selection is made of some of the best wheat plants, namely those having all the typical characters of the varieties cultivated. All the morphological characters, even the apparently least important, are subjected to careful examination: tillering, development and structure of the straw, length and appearance of the ear, of the paleae and glumes, form, structure, color, volume and weight of the caryopses. Due consideration is also given to resistance to disease and to lodging.

The grains from the central part of each ear are sown in small plots by means of special boards fitted with pegs at equal distances from each other. The plants thus obtained are, again, in the following year, selected according to the same criteria. The seed thus obtained is sown in a special plot in which the wheat is further selected removing all those plants which do not show clearly all the characters of the variety to which they belong, or which reveal signs of degeneration or sickliness.

The seeds from this plot are sown in the school farm (in which selection continues), which in its turn provides the seed wheat for all the farms of the "Capezzine" estate.

The mechanical selection is carried out on the physiologically selected wheat by means of winnowing and other machines that remove the vetches and other seeds and impurities, and grade the wheat according to its density, and lastly it is selected by hand, this last operation, especially in certain years, having been found extremely useful.

The cost of the mechanical selection of 100 hectolitres (275 bushels), weighing 7,600 kg. (144.4 cwt), at 23 fr. per hecto (6*s* 7 3/4*d*. per bushel) worth 2300 (fr. £91.5*s* 4 3/4*d*.) was the following:

	Fr.	£ s. d.
a) Winnowing	3.33	(0. 2 7 3/4)
b) Freeing from vetches	6.00	(0. 4 9 1/4)
c) Grading	5.00	(0. 3 11 1/2)
d) Hand selection (not necessary every year, nor for all the wheat	102.00	(4. 0 11 1/2)
e) Amortisement of machines	9.00	(0. 7 1 3/4)
Total Expense	125.33	(4.19. 5 3/4)

Products.

	Fr.	£ s d
a) Seed wheat 91.66 hectolitres (252. bushels) weighing 7066 kg (134.25 cwt.) at 33 fr. per hectolitre (9*s* 6*d* per bushel)	3024.78	(120. 0 7 ½)
b) Vetches 3.50 hecto. (9.63 bush.) or 233 kg. (4.43 cwt.) at 6 fr. per hecto. (1*s* 8 ¾*d*) per bushel	21.00	(0 16 8)
c) Small wheat 2.50 hecto. (6.88 bush.) or 150 kg. (2.85 cwt.) at 14 fr. per hecto. (4*s* 9½*d* per bush.).	35.00	(1 7 9¼)
d) Offal for poultry 1.67 hecto. (4.59 bush.) or 105 kg. (1.1 cwt.) at 6 fr. per hecto. (1*s* 8 ¾*d* per bush.).	10.02	(0 7.11 ½)
e) Impurities 0.67 hecto. (1.84 bush.) . . .	—	—
Total value of products . . .	3090.80	(122.13. 0 1/)
Expense to be deducted . . .	125.33	(4.19. 5 ¾)
Net value of products . . .	2965.47	(117.13. 6 ½)
Value of 100 hectos of wheat before selection	2300.00	(21. 5. 4 ¾)
Profit on 100 hecto. (275 bushels) . .	66.47	(26.5 8. 1 ¾)

This profit of 6.65 fr. per hecto. (1s. 11*d*. per bushel) represents the cost of the physiological selection, and the industrial profit.

The profit on the production of clover seed is given by the difference between the value of the hay lost in the second mowing and the value of the seed, minus the necessary expenses.

The experiments made by the author on this subject were carried out in 1906-1909 and 1911.

Yield per hectare (2.47 acres) —	1906		1909		1911		average	
	Kg.	cwt.	Kg.	cwt.	Kg.	cwt.	Kg.	cwt.
Seeded hay and husks .	2260	42.94	2500	47.50	2400	45.60	2386	45.33
1st. crop hay	3090	58.71	3000	57.00	3400	64.60	3363	63.90
2nd. crop (lost in the plots in which the seed is harvested)	2715	51.51	3500	66.50	2800	53.20	3005	57.10
Seed , ...	350	6.65	400	7.60	360	6.84	370	7.03

The cost of production (*C. p*) of one quintal (1.968 cwt.) of clover seed is given by the following formula :

$$\text{C. p.} = \frac{\text{F} - \text{S} + \text{s}}{\text{P}}$$

in which *F* represents the value of the hay lost on the second crop left for the production of seed ; *S* the value of the seeded hay and husks ;

s the cost of threshing, cleaning and storing the seed, and P the number of quintals (1.968 cwt.) of seed yielded by one hectare (2.47 acres).

And as the average price of clover hay is 9 fr. per quintal (3*s* 7 ½*d* per cwt.), of the hay made after seeding 4 fr. per ql. (1*s* 7 ¼*d* per cwt.), and the cost of threshing etc. is 12 fr. per ql. (4*s* 10*d* per cwt.) of seed, we get :

$$\text{C. p.} = \frac{270{,}45 - 95{,}44 + 44{,}40}{3{,}70} = 59.30 \text{ per ql. or } 23s\ 11d \text{ per cwt.};$$

so that as long as clover seed commands the high prices that it does now, namely 120 to 180 fr. per quintal (48*s* 5*d* to 72*s* 7 ½ *d* per cwt.) its production will continue to be highly remunerative.

Though the above data (which represent only a small part of a work not yet wholly completed) are not sufficient to allow of general conclusions being drawn, they point clearly to the benefits to be derived from selection in the seed industry.

MINKLER, FREDERICK C. **Cost of producing Milk at the College Farm of the New-Jersey State Agricultural College and Experiment Station.** — *Thirty-first Annual Report of the New-Jersey State Agr. Experiment Station.* 1 Vol., pp. XV + 424. *Report of the Animal Husbandman,* pp. 51-67. Paterson, N. J., 1911. **706**

United States: New Jersey

The increased cost of all feed stuffs as well as labor makes the problem of profitable milk production an important one for farmers and dairymen.

Even the value of good cows has increased 20 per cent during the last two years, despite the fact that the price of milk has not kept pace. Accurate records of the amount of feed consumed by the College Farm dairy herd were kept during the past year and are given in detail below. Tvo sets of calculations are given, one basing the cost of producing milk on the actual cost of growing and harvesting the forage, roughage and ensilage, with the grain mixture charged at car lot prices; the other calculation being based on market prices of the products.

The herd, consisting of 31 head of mostly grade cows of the four breeds Holstein, Jersey, Guernsey and Ayrshire, consumed during the year the following amounts of feed and roughage:

	Amount in Tons.	Actual Cost Growing and Harvesting per Ton.	Total Cost
Green Forage	142.25	$2.98	$383.12
Mixed Hay	21.78	4.82	104.97
Oats and Pea Hay	2.32	4.94	11.46
Alfalfa Hay	12.00	5.34	64.08
Corn Stover	19.00	4.00	76.00
Ensilage	172.00	3.51	603.72
Beet Pulp	10.5	23.00	241.50
Mixed grain made up as follows:			1 487.43
	Total		$2 972.28

	Pounds	Per Ton.	Total Cost
Distillers' Grains	72 800	$30.00	$1 092.00
Wheat Bran	35 700	27.00	475.20
Oil Meal	18 100	35.00	316.75
	126 600	$30.00	$1 883.95
Less amount fed to bulls and young stock	23 475	30.00	396.52
	103 125		$1 487.43

	$
Average cost per cow per year for feed alone	95.73
» » per day for feed alone	0.262
» » per quart of milk	0.024

Placing market valuations on the home grown products and considering four tons of forage equivalent to one ton of hay, the value of the feed consumed was as follows:

	Amount in Tons.	Market Value per Ton.	Total Value
Green forage equivalent to hay	35.65	$12.00	$427.32
Mixed Hay	21.78	15.00	326.75
Oats and Pea Hay	2.32	15.00	34.80
Alfalfa Hay	12.00	20.00	240.00
Corn Stover	19.00	8,00	152.00
Ensilage	172.00	5.00	860.00
Beet Pulp (car lots)	10.5	23.00	241.50
Mixed Grain (car lots)	51.31	30.00	1 487.43
Total of feed consumed			$3 769.80

	$
Average value of feed consumed per cow per year	121.60
» » » » » » per day	0.333
» » » » » quart of milk	0.0304

Labor and Expenses.

The following charges are based on actual cost of labor and do not include supervision:

	.$
Labor (one man for 12 cows) at $1.50 per day . .	1 332,00
Bedding (one bale shavings for 20 cows per day) .	164.80
Stabling ($5 per cow per year)	155.00
Interest (31 cows at $100 each at 5 %)	155.00
Depreciation in value of cows at 10 %	310.00
Bull $200 at 5 % = $10; cost of keep $50	60.00
Total cost of labor, bedding, etc. 31 head .	$2 176.80

	$
Average cost for labor etc. per cow per year . . .	70.22
» » » » » » per day . . .	0.192
» » » » per quart of milk . .	0.0176

The charge of $5 per year per cow for stabling covers the extra cost for the stable construction necessary in producing high grade market milk.

Further than this no charge is made for the investment in the farm itself or the dairy buildings, nor for dairy apparatus, milk utensils, incidental expenses, or insurance.

Based on actual cost of growing and harvesting products consumed and of labor, the total cost for feed, labor, etc. for the year was per cow $165.95; based on market valuation of feed consumed, $191.82. The yield of 31 cows averaging 8 661 lbs. of 3.96 % milk, the total cost per quart of milk will be in the first case $0.0416, in the second case $0.0480. No credit, however, is given the cow for the manure voided or the calf produced, neither is the farmer's time charged for. Calculating the manure worth $20 per cow, and the grade calves $6.00 each at five days old, the cost of producing 4 % milk even with the high yields reported, and not including cost of supervision, was approximately 4 cts. per quart.

There is a marked difference between the income from the various cows when comparism is made by grouping the grades and pure breds of each breed together, and classifying the herd on this

basis. The following table identifies the herd by breeds and gives the actual amount of milk, butter fat and estimated butter, together with the income per cow at the price received for College Farm milk at the farm, in cans:

Comparison of Yields and Income by Breeds.

Breed	No. of cows	Average yield of milk — lbs.	Average test for fat — %	Average yield of butter fat lbs.	Average yield of estimated butter lbs.	Average yield of milk per day (365) lbs.	Average number of days in milk	Value of milk at 6 c. per quart
Holstein	16	9 724.2	3.43	333.91	389.56	26.6	284	$ 271.88
Jersey	7	7 978	5.17	411.84	480.48	21.9	293	223.06
Guernsey	4	5 822	4.85	282.42	329.49	15.9	212	162.78
Ayrshire	4	8 630	3.72	321.43	375.00	23.6	270	241.30

The above is significant, showing that regardless of breeds there is, at 6 c. a quart for the milk, a clear profit in dairying when first class animals are maintained in the herd. The Holsteins rank first in lbs. of milk, while the Jerseys, as shown by the following table, outclass all others from a standpoint of butter production.

Comparison of Yields and Income on a basis of 4 % butter fat.

Breed	No. of cows	Average yield of milk — lbs.	Fat — %	Equivalent to 4 % milk — lbs.	Income per cow on 4 % fat basis at 6 cents per quart — $
Holsteins	16	9 724.2	3.43	8 348	233.41
Jerseys	7	7 978	5.17	10 296	287.87
Guernseys	4	5 822	4.85	7 061	197.42
Ayrshires	4	8 630.3	3.72	8 036	224.68

The Jerseys show a good margin from a butter fat basis, while the Guernseys are unusually low since three of the cows were farrow for several months owing to the fact that the bull used was not a sure breeder. The average weight per cow of these 31 head was 1 231 lbs.

Profit on Steer Fattening in the Open in N. W. Canada. — See above No. 681. 707 Canada

Prizes for Book-keeping by small Farmers in East Prussia. (Buchführungsprämien für Kleingrundbesitzer). — *Georgine*. Königsberg, 2. März 1912. 708

The East Prussian Agricultural Chamber is arranging for the distribution of prizes with the object of encouraging book-keeping in small farms.

Germany: East Prussia

For these prizes only small land-owners or members of their families who personally keep their farm accounts may compete, and their books, regularly kept, must cover at least one whole agricultural year and consist of the following accounts:

1. Cash account in which every single item of receipt and expenditure in money must be entered. These items must, where possible, be divided into two classes, that is: one concerning the farm and the other the farmer's private account.
2. Family account, in which everything in kind taken by the family from the farm, must be duly entered.
3. Inventory book, or account showing the value of the farm buildings, of the live stock, machines and implements, and the remaining dead stock.
4. Profit and loss account.

The total amount available for prizes is 400 marks (about £ 20). A special commission composed of members of the financial and accountants'section of the Chamber of Agriculture will award the prizes.

It is understood that the economical data concerning the single competitors, thus laid before the judges, will be considered strictly confidential.

No entry for this competition will be allowed after the 1st of April and the account books are to be handed in between the 1st and 15th of July 1912.

AGRICULTURAL INDUSTRIES

INDUSTRIES DEPENDING ON ANIMAL PRODUCTS.

709 BERTARELLI Prof. ERNEST. **The Milk Supply at Genoa** (1). Como una grande cidade resolveu o questao do fornecimento do leite)· *Chacaras e Quintaes*, Vol. V, No. 2, pp. 4-9. S. Paulo, Brazil, 15 de Fevereiro de 1912.

Italy

In this paper written especially for the Brazilian review, the writer, professor at the University of Parma, Italy, describes the economical and simple organisation, entirely due to private initiative, which supplies Genoa with excellent milk.

Genoa numbers about 300 000 inhabitants; in its environs there are neither pastures nor any extent of meadows, and, in consequence up to a few years ago milk was very dear and was generally skimmed and watered. An enquiry which was made by the municipal authorities revealed that of the samples of milk taken in various shops no less than 87 % were skimmed. The proof that the public had no confidence in its milk supply is given by the fact that the average daily consumption of milk per inhabitant barely reached 100 grammes, about 3 ½ oz.

Some vain attempts were made to supply Genoa with milk from the Piedmontese Alps, about 200 km. (120 miles) distant; another scheme according to which the Municipality itself would have sold milk, failed also.

On the other hand the greatest success attended a cooperative association of milk producers, bearing the name of « Unione agraria ». This association numbers among its members some producers of the neighbourhood of Genoa; but the majority reside at Tortona, province of Alessandria.

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(1) See *Bull.* July 1911, No. 2209. (*Ed.*).

The milk is purchased with certain guarantees, it is then refrigerated and sent, with all due care, to Genoa where it is sold by branch houses of the association.

The producers are paid for this pure and wholesome milk at the rate of 17 to 19 fr. per 100 kilos (7.35*d* to 8.21*d* per gal.) according to its quality and the distance it has to be conveyed.

As for hygienic guarantees, the cow sheds are regularly visited by veterinary surgeons who exclude the milk of diseased cows. The tuberculin test has not been adopted, but all animals presenting symptoms of disease are removed. All the cow keepers are obliged to permit these visits and to keep their cow houses scrupulously clean. As soon as the cows are milked, the milk is filtered and refrigerated either at the farm itself under the supervision of the Union or at the seat of the association at Tortona. The milk cans are sealed and traverse the distance from Tortona to Genoa, 80 km., (48 miles) in two hours. On arrival at Genoa the milk is again filtered, refrigerated and distributed to the retail branches. In these shops, which are now fifteen in number, the milk is kept in sealed cans (Fliegel, Mazza system) fitted with stirrers and, in summer, with a central tube filled with ice.

The retail price of the milk is 35 centimes per litre (1*s* 3.14*d* per gal.).

The following figures show the cost and expenses:

	Per quintal	Per gallon
Cost price of refrigerated milk at Tortona .	19 fr.	8.21*d*
Carriage to Genoa	2 »	0.86»
Carriage from railway to town	1 »	0.43»
Town duty (octroi).	4 »	1.73»
Handling and storing at Genoa.	2 »	0.86»
Sale and general expenses	4 »	1.73»
Return of empties	1 »	0.43»
Total	33 »	14.25»

The milk being sold in Genoa at 35 fr. per quintal, the net profit is 2 fr. (0.89*d* per gal.).

In 1910 the Union sold 10 000 hectolitres of milk (220 000 gals,) in 1911 18 000 hectol. (396 000 gals.).

710 ZEEB. **Kuchler's Patent Hygienic System for Distributing Milk.** (Das hygienische Patent-Kuchler-Milchausschank-System).—*Deutsche Schlacht-und Viehhof-Zeitung*, 12 Jahrg., Nr. 8, pp. 112-113. Berlin, 25. Februar 1912.

Germany

Patent milk-carts are now used in Munich for the distribution of milk. These have the following advantages: 1) they prevent the milk being adulterated, after it is put in the cans; 2) they prevent a partial rising of the cream to the surface, if the milk stands for some time; 3) they prevent all contamination when the milk is being poured out.

The cart has four divisions. with two cans containing 400 litres (88 galls.) each, and two containing 100 litres (22 galls.) each; so that it holds altogether 1000 litres (220 galls.) The cans can be taken out of the cart, though this is not necessary, for filling and other ordinary operations. To each can is attached a strong, officially graduated, glass, for measuring out the milk. The buyer's milk-jug is placed under this apparatus on a moveable plate, which when not in use is pressed against the former by a spring. Therefore, before a jug can be placed on it, it must be pressed downwards. This is affected by a lever which is connected with a stirrer inside the can. The milk is thus throughly stirred up, before any of it can be drawn. The plate with the jug on it is then pressed upwards by the spring against a second plate, which is fastened to the bottom of the graduated glass, and in the middle of which is the opening for letting out the milk. Any desired quantity can then be obtained. It passes first from the can into the measuring glass, and then through the opening in the bottom of the latter into the jug. The whole process is exceedingly hygienic, and there can be no contamination from dust or dirty hands. Neither can the milk be watered, as after the cans are filled they are sealed with lead. The cans, measuring glass, and all other parts can be cleaned without difficulty.

Samples of milk taken at different times from the cans have shown on analysis almost the same content in fat, proving that the stirrer answers its purpose. Ice in summer, and a small acetylene apparatus in winter equalise the temperature inside the cart.

The Kuchler Company also constructs refrigerators on the same principle as the milk carts. They are intended for shops, and the average temperature maintained is 8° C. (46.4° F.).

PETERSSON, ERNST; SADLER, JAMES; and FETLICK, OTTO. **Milk Standards.** — *Schweizerische Milchzeituug*, 35. Jahrg. Nos. 10, 11 and 12. Schaffhausen, 2. 6. and 9. Feb. 1912. — *The Farmer and Stockbreeder*, Vol. XXV, No. 1170, p. 368. London, Feb. 26, 1912. — *Molkerei-Zeitung*, 22. Jahrg., Nos. 5 and 6, pp. 51-52 and pp. 62-64. Berlin, 3 and 10 Feb. 1912. **711**

Germany. Great Britain. Switzerland

The fat content of milk is not more important than its other constituents and the authorities are mistaken if they estimate its value as a food-stuff solely by the former. If a minimum limit of fat content and of the specific weight be fixed, adulteration is encouraged. If the standard be put too high, perfectly normal milk may be excluded from sale. Therefore no fixed standard should be laid down, and (according to Sadler) "all the milk which a cow has given at any time must be considered as whole milk".

To judge of milk properly all its constituents must be taken into consideration; and an excellent system has been introduced in Swedish dairies since 1908. Several dairies (5 to 8) form an association, and appoint a dairy specialist. The latter tests their milk for its fat content (by Lindström's system) three or four times every month. He also judges of its taste and smell, determining its dirt content by the "Record" method and by Barthel's reductase tests. The milk cans are also inspected. The milk is divided into three or four classes according to the specialist's report. Thus:

1) High grade milk.
2) Second » »
3) Third » »
4) Bad milk, unfit for use.

The decision of the expert fixes the tariff of charges. The price of the high grade milk is determined according to the price of butter for the time being and according to its fat content. This is the standard, and from it a reduction is made, varying from 0.55*d* to 2.81*d* per gallon, for second and third grade milk. Milk of the fourth class is usually rejected.

In Sweden there are now 58 dairies belonging to such associations, and many carry out this system independently. The percentage of milk belonging to Classes II and III was at first considerable, and a good deal also belonged to Class IV. There is however, among farmers, a tendency to improve the quality of milk and this tendency is encouraged by the higher price which is paid for a higher grade of milk.

712 DEAN H. H. **System of Valuing Milk for Cheese Making.** — *Farm and Dairy*, Peterboro, Ont., Vol. 30, No. 50, December 14, 1911, pp. 3-6-9.

Canada

The basis of settlement among patrons of cheese factories, after paying for the cost of manufacturing, selling and other legitimate expenses, must include the following points: 1. It must be fair and just to all concerned. 2. It should be inexpensive. 3. It must be applicable to factory conditions and suit the needs of the people. 4. It must be supported by a majority of the patrons.

Three systems of valuing milk are discussed. By the first system the returns from cheese sold are divided among patrons by the "pooling plan" according to the weight of milk delivered. This system is based on the false assumption that all milk is of equal value per 100 lbs. for the purpose of making cheese.

The second system is known as the "fat system". The basis or principle of this test is that all normal milk for cheese making is valuable in proportion to the fat which it contains. It is argued by the advocates of this system that the fat is the most valuable part of the milk; that the yield of cheese is in fair accord with the fat content of the milk; that the testing of milk for fat can be applied to factory conditions. Against this system a number of objections are urged, the chief being that the cost of testing the milk is too great and that the fat is not an exact measure of the relative cheese value of milk. Tests showed that as the percentage of fat in the milk decreased from 5 to 3 there was an increase in the yield of cheese per pound of fat in the milk, but a decrease in the pounds of cheese made per 100 lbs. of milk.

The third system is known as the fat-casein plan. The arguments stated in favour of this plan were as follows:

1. The fat and casein of milk are the two chief and most valuable constituents which enter into the making of cheese.

2. The yield of cheese is fairly in accord with the fat-casein content of the milk. During the season of 1910, at the O. A. C., the extreme variation of the yield of cheese per pound of fat and casein was 1.607 lbs. of cheese in the month of June to 1.452 in October, a difference of but 0.155 lbs.

3. This is the fairest and most just plan yet devised because it comes nearest to a measure of the cheese yielding capacity of normal milk.

Against this plan it is argued that the double testing is expensive and not practical under factory conditions.

As an alternative the author suggests the determination of the percentage of fat in milk by means of the Babcock test and then adding 2 for casein.

That the "fat plus 2" is near enough for all practical purposes is indicated by the results of tests for casein at 10 cheese factories in Ontario during the season 1911, May 15th to September 15th, where the average percentage of casein in milk of between 400 and 500 patrons, was 2.22. The average percentage of fat in the milk as delivered by these patrons was 3.44.

The excess of casein above two per cent. is counterbalanced by the fat and casein lost in the whey, so that when the factor 2 is added to the percentage of fat, we have for all practical purposes, the available percentage of fat and casein in milk for cheese making.

Summarizing and concluding, the author observes:

1. Milk and cheese at factories ought to be tested, because of the natural and artificial variations which milk is subject to.

3. Both fat and casein ought to be determined and both are of equal value pound for pound for the manufacture of cheese, at least, casein is worth as much or more per pound than is milk fat, because it is the nitrogen and moisture carrying compound, which makes it of special importance in milk for cheese making.

3. Legislation compelling the testing of milk at cheese factories and paying for he same on a fat-casein basis, and the appointment of public inspectors for the purpose of accurate testing may be necessary in the near future to prevent fraud on the public and to obtain "cold justice" for patrons of cheeseries throughout Ontario.

INDUSTRIES DEPENDING ON PLANT PRODUCTS.

PORCHET, F. (Director of the Vine-growing station of Lausanne, Switzerland). **The Wines of 1911 in the Canton of Vaud, Switzerland** (Les vins de 1911 dans le Canton de Vaud, Suisse). — *Procès Verbaux de la Société Vaudoise des Sciences naturelles*, No. 4, 1912. Séance du 7 Fév. 1912, Lausanne. — *La Terre Vaudoise*, 4e Année, No. 5, pp. 49-51; No. 6, pp. 60-62. Lausanne, 3 et 10 Février 1912. **718**

The persistent drought of the summer of 1911 hindered the usual exchange of matter between the vine-leaves and the grapes, **Switzerland**

so that as vintage time approached the grapes were poor in sugar, while their total acidity was still high.

On September 5, 1911, on analysing the grapes from the Champ de l'Air, (Vine-growing Station) the writer found 10.25 % of sugar and 15.4 ‰ of total acidity. On September 12 the figures had scarcely changed: sugar 10.85 %, acidity 15.4 ‰. Some light rains (10 to 15 mm. [0.4 to 0.6 in.]) between the 15th and 16th September were sufficient to alter sensibly these figures. On September 19 analysis showed that the sugar had risen to 16.27 %, whilst the acidity had fallen to 8.9 ‰. A sudden transformation had thus taken place in the grapes: the absorption of moisture though slight had increased the sugar and diminished the acidity.

The persistent drought of 1911 caused a further anomaly: the general diminution of the acids. Already in the must a low degree of acidity was found, and this is the general character of the 1911 wines.

Composition of the 1911 Vaudois musts and wines. — In order to have precise data on this object, the Vine-growing station of Lausanne analysed, during the vintage, 142 typical samples of musts. The readings with Oechsle's densimeter ranged from 60 to 92 degrees, but 81 % of the musts gave between 70 and 90 °. The determinations of sugar by chemical analysis have confirmed very exactly the densimeter readings.

The wines resulting from the fermentation of these musts have theoretically an alcoholic content comprised between 8 and 12.4 %. 67 % of these wines contain 10 % of alcohol and upwards.

The total acidity of the 142 musts that were analysed varies between 4.3 and 8.8 ‰. 64 % are below 7 ‰, whilst in normal years the acidity ranges from 6 to 12 ‰, that is, an average of 8 ‰. Since fermentation generally causes the acidity to diminish by 1 to 1.5 ‰ it was easy to foresee at vintage time that the new wines would have an extraordinarily low degree of acidity.

To ascertain this experimentally, the station analysed, in January 1912, 36 samples of clear wines produced in districts where the acidity of the musts was lowest (shores of Leman), and found that only one of the 36 samples contained less than 10 % of alcohol, and only one more than 6 ‰ of total acidity. The lowest amount of acidity found was 3.5 ‰. It is true that in 1900 and 1906 in the Vaudois vineyards some wines were found here and there containing less than 4 ‰ of acidity, but this was quite exceptional, as the average acidity varied between 6 and 7 ‰. In 1911 on the contrary it ranged from 4 to 5 ‰ in the great majority of the samples that were analysed.

To form an exact idea of the composition of the Vaudois wines, it is necessary to await the results of the analytical statistics which are drawn up at the time of the first racking (1). It can however already be stated that the Vaudois 1911 wines are precocious.

From the first they formed a very agreeable beverage, as they were not at all acid. They must be racked soon and bottled when still young. According to all probability they will also ripen quickly in casks or bottles.

Treatment of the Vaudois 1911 wines. — The exceptional composition of the wines, together with the abnormal mean temperature of December and January, render necessary a special watchfulness, and in some cases perhaps a special treatment. Everything that tends still further to diminish the low acidity of the wines must be carefully avoided, as for instance, their prolonged contact with the lees; and therefore it is recommended to rack them much earlier than usual.

On the other hand the mild temperature of the past winter exposes wines to two other dangers: 1. The disengagement of carbonic dioxide gas, which would cause the finer particles of the lees — ordinarily containing the germs of wine-diseases — to reappear in suspension in the wine. 2. A second very slow fermentation of the undecomposed sugar, which would cause a certain motion in the wine; should this second fermentation appear the wine must be immediately racked.

As the 1911 Vaudois wines generally fermented rapidly and completely, they are in consequence not liable to dangerous second fermentations. On the other hand, unless the temperature were to fall considerably there is reason to fear, especially in not very deep cellars, the *rising of the lees*, such as takes place in spring in wines that have not been racked. To prevent this, it is sufficient to rack, at the proper time, the new wines. If the rising of the lees should already have commenced, the wine must be immediately racked, after fumigating thoroughly, with sulphur dioxide, the vessel into which it is poured. One week after racking, potassium bisulphite in crystals, at the rate of 5 in 100 000, should be added by placing it in a small linen bag and suspending and agitating it in the wine. As soon as the wine is again perfectly clear it is to be racked a second time. The same treatment will be found successful with those

(1) The analytical statistics of Swiss wines appears every year in the *Travaux de Chimie alimentaire et d'Hygiène* published by the Swiss Federal Sanitary Service.

wines which, either racked or unracked, show a tendency to turn brown on contact with the air: the so called « *casse* ».

Summarizing, the author advises to begin the spring racking in February, separating the wine from the lees, and to watch carefully those wines that have not yet been racked.

714 MUTTELET, F. and TOUPLAIN, F. **Arsenate of Lead in Viticulture.** (1) (L'Arseniate de Plomb en Viticulture). — *Annales des Falsifications*, V. Année, No. 30, pp. 9-16. Paris, Janvier 1912.

France

The use of arsenical insecticides, and especially of preparations of arsenate of lead, has considerably increased of late. This has led to the question being raised as to whether such products are a danger to health. The Academy of Medicine has declared that they are, and has expressed the hope that the use of these insecticides may be either entirely forbidden, or at least placed under strict regulations.

The Service for the Repression of Fraud has therefore decided to attack this complex problem, by searching for arsenic and lead in products derived from vines that have undergone the arsenic treatment, namely, grapes, wines, grape pomace and lees.

The results are given in the following table:

Samples.	Arsenic, mgm.	Lead, mgm.
Vines treated:		
Whole dried grapes (17 samples); per 100 gm. of dry product	0.050 to 0.300	0.00 to 200.0
Dried pomace (31 samples) per 100 gm. of dry product	0.012 to 1.250	0.00 to 20.00
Wines (10 samples); per 1 000 cc. of must	0.012 to 0.620	nil
Lees (10 samples); per 1 000 cc. of must . . .	0.040 to 0.400	nil
Vines not treated:		
Dried pomace (2 samples); per 100 gm. of dry product	0.038 to 0.060	nil
Wines (2 samples); per 1 000 cc. of must . .	0.500	nil
Lees (2 samples); per 1 000 cc. of must . . .	0.500	nil

Conclusions:

1. As regards arsenic.

Grapes, grape pomace, wines, second wines and lees obtained

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(1) See *B*: April 1911, No. 1260. (*Ed.*).

from vines treated with arsenate of lead contain no more arsenic than what is found in the products of non-treated vines.

2. As regards lead.

Wines and second wines contain no lead.

In certain cases the lees contain a considerable proportion of lead. There is therefore some danger in drinking wines or second wines before the lees are precipitated.

Grapes sometimes retain on their surface a certain quantity of lead, which makes their consumption dangerous.

PAVARI, ALDO. **The Action of Organic Acids on the Development of the Bacillus which Causes "turned" Wines.** (Ital. "*Girato*"; Fr. "*Tourne*"). (Azione degli acidi organici sullo sviluppo del bacillo producente il "*Girato*" dei vini). — *Giornale Vinicolo Italiano*; Anno 88, No. 6, pp. 104-108. Casale Monferrato, 11 Febbraio 1912. **715**

Italy

By previous experiments, the writer has shown that this affection of wines is due to a bacillus, and that the two most effective agents for combating the disease are heat and sulphur dioxide, alcohol being of little use, when albuminoids and sugars are present in perceptible quantities. The writer having already shown that 8 ‰ acid potassium tratrate arrests the development of the bacillus, and that tannin has very little effect, undertook the present experiments for the purpose of studying the antiseptic action of the other acids in wine.

Series A. — Development of the bacillus in cultures containing one of the acids which are found in wine or added during its manufacture.

Matic Acid.

Acid ‰	0,5	1	1,5	2	2,5	3	3,5	4	5	6	8	10
After 24 hours . . .	—	—	—	—	—	—	—	—	—	—	—	—
» 48 » . . .	—	—	—	—	—	—	—	—	—	—	—	—
» 3 days . . .	+	+	+	+	—	—	+	+	—	—	—	—
» 4 » . . .	+	+	+	+	—	+	+	+	—	—	—	—
» 5 » . . .	+	+	+	+	+	+	+	+	—	—	—	—
» 6 » . . .	+	+	+	+	+	+	+	+	+	—	—	—
Following days . . .	+	+	+	+	+	+	+	+	+	—	—	—

The development increased gradually with concentrations of 0.5 to 3.5 ‰, and decreased till 5 ‰, when it ceased.

Succinic Acid.

Acid ‰	0,5	1	1,5	2	2,5	3	3,5	4	5	6
After 24 hours . . .	−	−	−	+	−	−	−	−	−	−
» 48 » . . .	+	−	−	+	+	−	−	+	−	−
» 3 days . . .	+	+	+	+	+	+	−	+	−	−
» 10 » . . .	+	+	+	+	+	+	+	+	−	−
Following days . . .	+	+	+	+	+	+	−	−	−	−

Development usually weak; bacilli more numerous in the solutions of 0.5 to 1.5 ‰. In more concentrated solutions (3.5-4 ‰) the bacilli which developed died in the course of a short time, peshaps on account of the acidity which they produced and which increased the acidity of the solution, which already nearly reached the limit of concentration which they conld resist.

Citric Acid.

Acid ‰	0,5	1	1,5	2	2,5	3	3,0	4	5	6
After 24 hours	−	+	+	+	+	+	−	−	−	−
» 48 »	+	+	+	+	+	+	−	−	−	−
» 3 »	+	+	+	+	+	+	+	−	−	−
Following days	+	+	+	+	+	+	+	−	−	−

The development was almost as great as in the case of the malic acid solutions; little with concentrations of 3 and 3.5 ‰.

Series B. — Development of the bacillus in cultures containing 4 ‰ of acid potassium tartrate to which was added gradually increasing amounts of the preceding acids.

Matic Acid.

Acid ‰	0,5	1	2	3	4	5	6	7	8
After 24 hours.	+	+	+	+	+	—	—	—	—
» 48 »	+	+	+	+	+	—	—	—	—
» 3 days	+	+	+	+	+	+	+	—	—
» 4 »	+	+	+	+	+	+	+	+	—
Following days.	+	+	+	+	+	+	+	+	—

Very abundant development in the solutions from 2-4 ‰; less in the others.

Succinic Acid.

Acid ‰	0,5	1	2	3	4	5	6
After 24 hours	—	—	—	—	—	—	—
» 48 »	+	—	—	—	—	—	—
» 3 days	+	—	—	—	—	—	—
» 5 »	+	+	—	—	—	—	—
» 10 »	+	+	+	+	—	—	—
Following days	+	+	+	+	+	+	—

Moderate development only in the solutions of 0.5 and of 1 ‰ and after five days; very feeble in the others and scarcely any to distinguished in that of 5 ‰.

Citric Acid.

Acid ‰	0,5	1	2	3	4	5	6	7	8
After 24 hours	+	+	—	—	—	—	—	—	—
» 48 »	+	+	—	—	—	—	—	—	—
» 3 days	+	+	—	+	+	—	—	—	—
» 7 »	+	+	+	+	+	+	+	—	—
Following days	+	+	+	+	+	+	+	+	—

Development moderate in general; more in the solutions of 3-4 ‰.

The following conclusions may be drawn:

1. It is malic acid that allows the strongest development, namely at 5 ‰, while succinic acid checks it, when it occurs in the proportion of 3.5 ‰, and citric acid in the proportion of 4 ‰. With malic acid the development of the bacillus traces an ascending curve, up to the concentration 3.5 ‰, when the bacillus behaves as with tartaric acid. This seems to show that also malic acid may be a source of vital energy for the bacillus.

2. When acid potassium tartrate is present to the amount of 4 ‰, the concentration limits rise to 7 ‰ for malic and citric acid and 4-5 ‰ for succinic. This means that the bacillus can resist a *total acidity*, which, expressed in tartaric acid, may exceed 10-11 ‰. Thus it is clear that *even a high total acidity does not mean an effective prevention of "turning"*.

3. Succinic acid checks the development of the bacillus more than the other two, but its full effect can only be obtained with a concentration of 4 ‰, which is *pratically impossible*.

4. The addition of malic and citric acid, within the limits allowed by the law, neither prevents nor arrests the disease.

5. The best course is to freely use sulphur dioxide, and to keep the wine constantly clear by the most careful *hygienic* rules.

716 FOTH. **The Alcohols of Maize and Potato.** (Alcool de Maïs et de Pomme de terre). — *Bulletin de l'Association des Chimistes de sucrerie et de distillerie*: 29e Année, T. XXIX, No. 7, pp. 471-472. Paris, Janvier, 1912.

France

A comparison has been made between the working of 90 kg. (198 lb.) of maize and 10 kg. (22 lb.) of barley in producing 36 litres (7.92 gals.) of alcohol with that of 100 kg. (220 lb.) of potatoes at 18 % and 1,80 kg. (3.96 lb.) of barley in giving 12 litres (2.64 gals.) of alcohol.

In a factory where 600 litres (132.00 gals.) of pure alcohol are made, the steam required for a hectolitre of pure alcohol is as follows:

Potatoes, 1 150 kg. (21.85 cwt.) for heating, 2 850 kg. (54.15 cwt.) for the machines.

Maize 1950 kg. (37.05 cwt.) for heating, 2850 kg. (54.15 cwt.) for the machines.

Thus for potatoes 4 000 kg. (76.00 cwt.) of steam = 120 kg. (2.28 cwt.) of coal = 3,75 fr. (2*s* 11.7*d*).

For maize 4800 kg. (91.20 cwt.) of steam = 144 kg. (2.74 cwt.) of coal = 4,50 fr. (3*s* 6.8*d*).

The cost is as follows:

	fr.	£	*s*	*d*
Maize 90 kg. (198.00 lb.) at 22,50 fr. (17*s* 10.3*d*) per ql.	20.25		16	0.9
Barley 10 » (22.00 lb.) » 0.20 » (1.9*d*) » »	2.00		1	7
	22.25		17	7.9
Deduct, draff	6.25		4	11.5
	16.00		12	8.4
Thus for 100 litres: (22 gals.) $\frac{1600}{36}$ = ...	44.44	£1.	15	3.2
Add, coal	4.50		3	6.8
Total	48.94	£1.	18	10.

without wages and amortisement.

For potatoes we have:

	fr.	£	*s*	*d*
100 kg. (22 lb.) at 18 %	5.75		4	6.8
Barley 1,8 kg. (3.96 lb.)	0.36			3.4
	6.11		4	10.2
Deduct, draff	0.75			7.1
	5.36		4	3.1
Thus for 100 litres (22.00 gals.) of alcohol $\frac{536}{12}$ =	44.67	£1.	15	5.4
Add coal	3.75		2	11 7
Total	48.42	£1.	18	5.1

without wages and amortisement.

It is clear that if the potatoes cost 5,90 fr., (4*s* 8.2*d*) this increases the cost of alcohol by $\frac{15}{12}$ = 1,25 fr. (11.9*d*) and consequently the price per hectolitre is raised to 49,67 fr. (£1. 19*s* 5*d*).

Thus 100 kg. (220 lb.) of potatoes at 5,81 fr. (4*s* 7.3*d*) + 1.8 kg (3.96 lb.) of barley at 20 fr. (15*s* 10.5*d*) may be replaced by 90 kg. (198 lb.) of maize at 22.50 fr. (17*s* 9.3*d*) + 10 kg. (22 lb.) of barley at 20 fr. (15*s* 10.5*d*).

717 AMMANN, LOUIS. **Studies on Pulps from Distilleries and Sugar-Factories.** (Comparaison des resultats obtenus par la macération et par la diffusion dans les distilleries agricoles des betteraves. — *Comptes Rendus de l'Académie des Sciences*, T. 154, No. 5, pp. 294-295. Paris, 29 Janvier 1912. — Influence comparée de l'eau et de la vinasse sur la composition des pulpes de sucrerie et de distillerie. — *Comptes Rendus de l'Académie des Sciences*, T. 154, N. 6, pp. 366-369. Paris, 5 Février 1912.

France

The Author has followed the processes of distillation of beets in a number of distilleries during two consecutive seasons, with a view to ascertaining whether the small concerns in which home-grown crops are treated by maceration, give as good results as distilleries of a more industrial type.

By determining the sugar contents of the slices before going into the diffuser or macerator and of the pulp remaining afterwards, he found that the two processes gave equally perfect results.

Thus owners of small concerns may use the maceration process without fear of leaving any sugar in the pulps fed to their live stock. The maceration battery, then, is the one for small concerns without specially trained staff, while the diffusion battery, being quicker and more compact, is preferable for factories dealing with over 50 to 60 tons of beets per day.

Beet-pulps are produced by both distilleries and sugar-factories, and it is further of importance to determine the influence on them of the liquid used to extract the sugar.

In the case of sugar factories, the beets are completely exhausted, and the pulp is only a by product; while in many distilleries the pulp is considered as the principal product. In the first case fresh water is used for the extraction, while in the second the liquid used is the hot residue from distillation. The differences in the resulting pulps are shown by the analyses made by the Author. Distillery pulps are richer in alcoholic extract, phosphoric acid, and soluble matter, and are more readily assimilated by animals; they are consequently of higher feeding-value.

718 **The Starch Industry in Holland.** (Les industries des produits chimiques et de la fécule). — *Moniteur Scientifique*, 56e Année, 842e Livraison. — *Le Mercure Scientifique*, pp. 11-12. Paris, Février 1912.

Netherlands

The starch of various crops, indigenous and otherwise, such as potato, wheat, rice, maize, is a raw material of great importance for several industries in Holland.

This industry began more than two hundred years ago as factories of starch products. In 1818 there were 31 of these factories in Holland, 15 of them being in North Holland (Zaan neighbourhood).

Rice and wheat, formerly the staples of this industry, have largely given place to maize, which is cheaper. The consumption of rice starch in Holland is insignificant, and what is manufactured is chiefly for export.

The preparation of maize-starch has increased considerably in the last ten years; there are three factories, whose output is largely consumed in the country, but some of it is exported, chiefly to Great Britain. The starch is prepared as powder and in lumps; the powder is used chiefly in the textile industry.

Wheat-starch, of which the manufacture is declining, is sent partly to Great Britain.

After the starch has been extracted from wheat-flour, gluten is obtained from the residue: this is used specially for making bread for persons suffering from diabetes. Maize-gluten is pressed and sold as cattle-food.

At present there are 13 of these starch-factories in Holland, employing 400 workmen; 8 of them are in the Zaan neighbourhood.

The following figures, from the Dutch Statistics of Importation, Exportation and Transit, show the imports and exports of cereal starch since 1847:

Period	Imports (metric tons)	Exports (metric tons)	Balance	
			Imports	Exports
1847-56 . . .	4	15	—	11
1857-66 . . .	28	6	22	—
1867-76 . . .	293	442	—	148
1877-86 . . .	2 257	2 350	—	93
1887-96 . . .	7 990	6 027	1963	—
1897-1906 . .	15 794	11 510	4284	—
1909	13 658	12 196	1462	—

The starch industry extended notably when the preparation of potato-starch began. The first factory was set up in 1840, at Muntendam, and it was soon followed by others; the increasing demand for this article caused a rapid increase in the number of factories and in their output. In a short time the peat soils in the provinces of Groningen and Drenthe, and later those in Over-ijsel, which are very useful for potato-growing after the removal of the peat, became real industrial centres.

The actual production of the starch is only a part, but the most important part, of the potato-starch industry: the other products are dextrin and glucose.

In Holland there are 30 factories, of various sizes, which prepare nothing but dry potato-starch; two others prepare wet starch, an intermediate product used for making dry starch and glucose. Six other Dutch factories use part of the starch, before drying, for the preparation of dextrin, which is obtained by heating with potassium nitrate. Six others treat the wet starch with acids to prepare glucose (also called potato-sirup).

Of these factories, 32 are in the province of Groningen; six of these are cooperative, while the rest purchase the potatoes required.

There are also some factories in which dextrin and glucose are prepared from dried potato-starch, or other starches (maize, sago, tapioca, etc.). The whole starch industry employs about 2000 workmen. In good years the total consumption of potatoes by the factories which shred on the premises is 12 million hectolitres (33 million bushels), weighing about 61 kg. per hl. (49 lbs. per bu.); at the normal price, this represents a value of about 20 million francs (about £800 000). The area occupied by potatoes for starch was 28 322 hectares (nearly 70 000 acres) in 1909. By intensifying the culture, the crop is made to keep pace with the growing demands of the industry.

The greater part of the dried potato-starch and dextrin is exported to countries having a large textile industry, especially to those with low import duties. The glucose is almost all consumed in Holland.

The imports and exports of potato-starch were about equal from 1847 to 1856, while in 1906 the exports exceeded the imports by over 63 000 tons, and in 1909 by 64 000 tons. The total production has nearly doubled in the last ten years. About 15 % of the amount produced is consumed at home; the exports go to Great Britain, Belgium, Italy, Spain, France, Hamburg (within the free port area) and Denmark.

With dextrin, also, the production is greater than the home demand, so that a good deal goes abroad; the chief purchasers are Great Britain (Lancashire), Belgium, Canada, Spain, Norway and Japan.

The Dutch statistics give only "potato-starch" and "articles prepared from potato-starch"; this last is used to include a number of products such as sago flour and maize flour, besides dextrin; consequently, no precise figures are available for dextrin exportation, but it is valued at 5000 tons a year.

Owing to technical and chemical progress, the glucose industry, which began in a small way some thirty years ago, has grown rapidly and is now an important industry providing for a large number of people. There are now 11 factories, including the 6 above mentioned, which turn out glucose; it is prepared either as a solid (known as grape-sugar) or as a liquid (sirup), the latter being the more important.

The sirup and grape-sugar are use in confectionery and for sweets; grape-sugar is also used in breweries, partially replacing malt. Glucose is used besides in the textile industry and in rice-husking.

Dutch glucose is generally superior to all others, but it is almost all used at home as the import duties in the surrounding countries are too high to allow of exportation; a small quantity goes to Great Britain.

GRÉLOT, P. **Split Green Peas, Coloured Artificially.** (Pois verts cassés colorés artificiellement). — *Annales des Falsifications;* V[e] Année, No. 39, pp. 18-19. Paris, Janvier 1912. **719**

France

The author first remarks that Mr. Pagniello has detected the use of chlorophyll and dextrine as a colouring for dried peas, little as one might expect it, and then turns to consider a similar fraud carried out by means of a colouring derived from coal.

Split peas, when not tampered with, show all tints, from the pure green of chlorophyll to yellow, while peas artificially coloured are uniformly dark green. If carefully looked at, most of them show layers of colouring matter on their surfaces. This matter can be easily detached, and it is found between the tegument and cotyledon in cases where the former still remains. The fraud is too simple to escape attentive observation.

From Mr. Grelot's investigations it results that the colouring is probably a sulphur conjugate, belonging to the group of quinones-oximes, analogous to naphtol green.

In addition to the colouring matter the peas also contain some gelatine, probably to retain the former on the surface, and also to cause a shiny appearance.

The decree of 4 July 1910 allows, by way of exception, the use of certain substances derived from coal for colouring bonbons, pastilles etc. But this is because only a very small amount is

necessary, and also because such products are not normal foods of daily consumption.

The colouring of dried vegetables continues to be strictly prohibited, and each case detected ought to be adequately punished.

720 BONN, A. **Repression of Food Adulteration in France:** Synopsis of the Principal Foods and of the Laws and Regulations concerning them. — *Annales des falsifications*, V[e] Annéè, N°. 39, pp. 20-25. Paris, Janvier 1912.

France

Nature of Foods —	Adulterations or transgressions to be sought for —	Ministerial Circulars or special laws, besides the law of August 1. 1905.
Butters Law of April 16, 1897; Law of July 23, 1907, Decree of Aug. 29, 1907.	Margarine	Law of April 16, 1897 (art. 1)
	Coconut oil	do.
	Other fats	do.
	Antiseptics	Ministerial Circular Dec. 15, 1908.
	Colouring (aniline colours are forbidden)	M. C. May 24, 1910
	Water.	M. C. July 20, 1911.
Beers Decree of July 28, 1908.	Substitutes for barley malt (exceeding 20 %)	Decree of July 28, 1908 (art. 1)
	Substitutes for hops	do.
	Sulphur dioxide (exceeding 1 in 10 000, with toleration of 10 %	M. C. April 14, 1911
	Antiseptics	Decree of July 28, 1908 (art. 40).
	Saccharine	Law of March 30, 1902. (art. 49 to 56). Law of Dec. 26, 1908 (art. 19).
	Colouring (none permitted, with the exception of caramel, and the extracts obtained from roasted cereals, starchy substances, inverted sugar or glucose).	Decree of July 28, 1908 (art. 4).
	Original density (small beer)	Decree of July 28, 1908 (art. 2).
	Toxic metals	

Nature of Foods	Adulterations or transgressions to be sought for	Ministerial Circulars or special laws, besides the law of August 1. 1905.
Ciders and Perries Decree of July, 28, 1908.	Alcohol, dry extract, mineral matter (small cider and small perry)	Decree of July 28, 1908 (art. 2).
	Sulphur dioxide, exceeding 2 per 10 000, with toleration of 10 %	M. C. of April 14, 1911.
	Saccharine	Law of March 30, 1902 (art. 49-54). Law of Dec. 26, 1908 (art. 19).
	Tartaric or citric acid, exceeding 5 per 10000	Decree of July 28, 1908.
	Colouring (by substances other than cochineal, caramel, and chicory infusion)	
	Antiseptics	M. C. of Dec. 15, 1908.
Flours	Excessive moisture	
	Mineral matters	M. C. of May 7, 1907.
	Flour, other than that specified	M. C. of May 1, 1907.
	State of preservation, commercial and baking quality.	
	Bleaching, by nitrous compounds not declared . . .	
Cheeses	Nature and quantity of fat. .	
	Mineral matters in the rind. Ba SO_4 etc.	
	Antiseptics	M. C. of July 19, 1910.
Preserved and dried fruits, Fruit cheeses Decree of Dec. 19, 1910.	Antiseptics	Decree of Dec. 19, 1910 (art. 15).
	Colouring matters	Order of Dec. 19, 1910 (art. 1-3).
	Preserved fruits, fruit cheeses, fruit sirups, declared " pure sugar "	
	Sweet substances other than saccharose	Decree of Dec. 19, 1910 (art. 9).
	Preserved green fruits : Copper (exceeding 1 per 10 000)	Order of Dec. 19, 1910 (art. 4).
	Dried fruit : Sulphur dioxide (exceeding 1 per 10 000)	Decree of Dec. 19, 1910 (art. 15).
	Nuts, moistened and sold by weight	

Nature of Foods	Adulterations or transgressions to be sought for	Ministerial Circulars or special laws, besides the law of August 1, 1905.
Fats and oils Decree of March 11, 1908; Decree of July 20, 1910.	Substances other than those named.	
	Fats:	
	Water (the presence of emulsified water renders the goods subject to the regulations for margarine)	M. C. of October 14, 1910.
	Oils:	
	Colouring (use of aniline colouring matter is forbidden)	M. C. of May 24, 1910.
	Labels, brands, marks (such as an olive tree or olive branch on bottles containing oil other than olive oil) .	
Milk	Watering.	
	Skimming.	
	Watering and skimming . .	
	Antiseptics	M. C. of Dec. 15, 1908.
	Bicarbonate of soda or other alkalis	M. C. of Jan. 24, 1910.
Margarines Law of April 16, 1897; Law of July 23, 1907; Decree of Sept. 5, 1907.	Butter (at most 10 %) . . .	Law of April 16, 1897 (art. 2).
	Antiseptics	M. C. of Dec. 15, 1908.
	Colouring (forbidden)	Law of April 16, 1897 (art. 2).
Bread	Nature of flour used	
	Sulphate of copper or other foreign mineral matter . .	
Sugars Decree of Dec. 19, 1910.	Colouring	Decree of Dec. 19, 1910 (art. 3).
	Vanillin sugar called "vanilla" sugar	Order of Dec. 19, 1910 (art. 2).
	Refined sugars:	
	At least 99 % of saccharose .	Decree of Dec. 19, (art. 1).
	White crystallized sugars:	
	From 98 to 99.5 % of saccharose	do.
	Inferior sugars, brown sugars from 85 to 98 % of saccharose	do.
	Inverted sugars:	
	Non-inverted sugar maximum . . . . 20 %	do.

Nature of Foods	Adulterations or transgressions to be sought for	Ministerial Circulars or special laws, besides the law of August 1. 1905.
Sugars Decree of Dec. 19, 1910.	Water, maximum . . . 25 %	
	Mineral matter . . . 0.5 %	
	Acidity as H_2SO_4 . . 0,35 %	
	Poisonous substances.	
	Molasses :	
	Mineral matter, maximum 12 %	Decree of Dec. 19, 1910 (art. 2).
	Poisonous substances . . .	
	Glucose in lumps :	
	Water . . . . maxim. 25 %	Decree of Dec. 19, 1910 (art. 4).
	Dextrin . . . . .15 %	
	Mineral matter . . . . 1.50 %	
	Acidity as H_2SO_4 . . 0,5 %	
	Arsenic	
	Crystal glucose, crystal sirup :	
	Water . . . . maxim. 25 %	
	Dextrin . . . . 45 %	
	Mineral matter . . 1 %	
	Acidity as H_2SO_4 . 0,20 %	
	Arsenic	
	Maltose :	
	Other sugars	Decree of Dec. 19, 1910. (art. 4).
Teas	Foreign substances	Congress for the Repression of Fraud (Geneva 1908 and Paris 1909).
Wines Law of Aug. 14, 1889; Law of July 11, 1891; Law of July 24, 1894; Law of April 6, 1897; Law of Jan. 28, 1903; Law of Aug. 6, 1905; Law of June 29, 1907; Law of July 15, 1907; Decree of Sept. 3, 1907.	Watering	M. C. of April 2, 1910
	Addition of alcohol	
	Colouring	Law of July 11, 1891 (art. 2).
	Mineral acids	do.
	Sodium chloride (beyond 1 per 1000)	do.
	Plaster of Paris (beyond 2 per 1000 of potassium sulphate).	Law of July 11, 1891 (art. 3) and M. C. of Jan. 10, 1908.
	Addition of sugar	M. C. of Feb. 18, 1910.
	Saccharine	Law of March 30, 1902 (art. 49 to 56).
	Sulphurous acid (beyond 0.45 per 1000)	Law of Dec. 26, 1908 (art. 19).

Nature of Foods —	Adulterations or transgressions to be sought for —	Ministerial Circulars or special laws, besides the law of August 1. 1905.
Wines Law of Aug. 14, 1889; Law of July 11, 1891; Law of July 24, 1894; Law of April 6, 1897; Law of Jan. 28, 1903; Law of Aug. 6, June 29, 1907; Law of July 15, 1907; Decree of Sept. 3, 1907.	with toleration of 10 %: 0.1 gr. free and 0.35 gr. combined per 1000	M. C. of April 14, 1911.
	Glycerine (forbidden)	Sup. Council of hygiene March 8, 1911.
	Antiseptics	M. C. of Dec. 15, 1908 and April 29, 1909.
	Sweetening	M. C. of May 13, 1908.
	Citric acid (beyond 0,5 per 1000)	M. C. of May 13, 1908.
	Tartaric acid	M. C. of Jan. 28, 1910.
	Turning sour or otherwise spoiling	M. C. of June 17, 1910.
	Deacidifying	M. C. of Jan. 26, 1910.
	Decolouration	M. C. of Nov. 23, 1909 and March 15, 1910.
	Removing sulphurous acid by chemical agents	M. C. of Dec. 28, 1909.
Vinegars Decree of July 28, 1908.	Conformity to designation . .	
	Content of acetic acid. . . .	
	Pyroligneous acid, mineral acids. Distillation residues. .	Decree of July 28, 1908 (art. 4).
	Artificial colouring	do. (art. 5).
	Alcohol vinegars: At least 55 per 1000 of acetic acid	M. C. of March 24, 1909.
	Wine Vinegars: At most 1° of non transformed alcohol.	M. C. of Sept. 18, 1911.
	Beer Vinegars: At most 0.5° of non-transformed alcohol	do.
	Cider Vinegars: At most 0.5° of non-transformed alcohol	do.

PLANT DISEASES.

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

Experiment and Demonstration Fields for the Control of the Diseases of the Olive Tree in France. — See above N. 599. 721 France

Publications of the Russian Government relating to the Control of Plant Diseases. (Obiavlenia ob Departamenta semledieliia G. U. S. i. S. Communicated by the Department of Agriculture of the Russian Government). — *Xurnal Boliesni Rastenii.* (Journal of Plant Diseases), God. V, N. 5-6, *ad fin.* S. Peterburg, 1911. 722

The Russian Government (Department of Agriculture) is publishing pamphlets for circulation with a view to promote and encourage the control of plant diseases; these pamphlets are distributed gratis on request. Last year the following were published. Russia

1. American gooseberry mildew (*Sphaeroteca mors uvae*).
2. Insects injurious to raspberry and currants.
3. Lepidoptera most harmful to horticultural plants.

The Agricultural and Horticultural Colleges, Agricultural Societies, and those of Rural Economy, can obtain copies of the above pamphlets gratis, on application either to the Inspector of Agriculture, or direct to the Government office (Agric. Section).

STATIONS FOR PLANT PATHOLOGY AND AGRICULTURAL ENTOMOLOGY.

728 MARCHAL, PAUL. **Summary of the Results of Researches on *Conchylis* and *Eudemis* during 1911.** (The Work of the Temporary Stations established in 1911, for the study of the most Efficacious Methods for the Destruction of *Conchylis* and *Eudemis*) (1). — (L'activité des Stations temporaires établies en 1911 pour l'étude des procédés les plus efficaces de destruction de la *Conchylis* et de l'*Eudemis*. Rapport sommaire sur les travaux accomplis par la mission d'étude de la *Conchylis* et de l'*Eudemis* pendant l'année 1911). — *Journal officiel de la République française*, 44e année, No. 44, pp. 1461-1464. Paris, 14 Fevrier 1912.

France

This is a preliminary report drawn up by M. Marchal, Director of the Paris Entomological Station, at the request of the French Minister of Agriculture, of the work accomplished by the temporary stations set up to study the best means of destroying *Conchylis* and *Eudemis*, two of the most serious vine pests in France.

M. Chatanay, Director of the Station at Châlons-sur-Marne, has turned to good account the large installations of lamp-traps which have been established in Champagne for the purpose of making experiments in the methods of control. He has proved the following points:

1. With a well-established system of lamps as in the case of the electric installation at Verzenay, it is estimated that the greater number of the moths hatched out since the preceding night in the area covered by the lamps are caught, and the number of eggs laid is thus reduced about 50 %.

2. The males and females are caught in about the proportions in which they naturally occur, and the females are in different stages of egg-laying. If the traps are set in fine weather from the commencement of the flight of the moths, most of the females caught have not yet laid their eggs.

3. At the commencement of flight, the males are taken in far larger numbers than the females, which shows that the former hatch

(1) See *B.* July 1911, No, 2269. (*Ed.*).

out earlier. The greater number are canght before fertilizing, and thus the capture of the males has about the same importance as that of the females.

4. The use of lamp-traps, as carried out in Champagne, has a definite, though limited, value, and is at least as efficacious as most insecticide spraying.

5. In the case of valuable vineyards, like those in Champagne, the lamp-trap method is practical and not excessively costly.

6. The chief disadvantage of this system is that it causes the destruction of parasitic Hymenoptera and other natural auxiliaries in the destruction of *Conchylis* and *Eudemis*. In any case, this aspect of the question requires further investigation.

7. The efficacy of lamp-traps depends upon the observance of certain rules of which, for Champagne, the following are the most important.

The traps should make a continuous net-work, over as extensive an area as possible; they should be placed nearly level with the ground in the immediate neighbourhood of the receptacles containing the liquid, as the reflection of the light in the liquid plays a great part in attracting the moths; the surface of the liquid should, therefore, be kept as bright and clean as possible and the cone of shadow thrown must be as small as possible. Since the action of the traps depends chiefly upon the rays of direct or reflected light, the sources of light must be fairly numerous, but not too bright; 8 lamps of 5 candle-power per acre would be very efficacious.

8. A succession of calm warm nights gives the maximum success in the use of lamp-traps.

M. Chatenay has also undertaken biological researches; and he states that meteorological conditions have great effect on the vitality, and consequently on the multiplication of the moths. The almost complete disappearance of the second generation of *Conchylis* observed in 1911 in Champagne, must be attributed to the excessive drought and heat in July. The investigator found the caterpillar in large quantities on black currant and *Galium Mollugo*. This caterpillar lives also on the woody parts, and when young, can in certain cases, make its way direct from the egg into the grape without appearing on the exterior.

As regards arsenical insecticides, M. Chatenay has observed that they act very slowly upon the caterpillars and sometimes only destroy them at the last stage of their development.

He recommends as a very important measure for the destruction of *Conchylis*, the sorting of the grapes at vintage-time, unless

the latter is very late, and states that, with few exceptions, wherever layering of the vines is practised, *Conchylis* is almost completely absent,

Mr. Feytaud, chief of the Bordeaux Station, has studied the action of insecticides and climatic conditions on the eggs of *Conchylis* and *Eudemis*. He has found that nicotine does not hinder the development of the embryo, but causes the death of the young caterpillar before it leaves the egg and at the moment of hatching.

Cupric mixtures kill the egg during its development. The action of sunlight is also efficacious, for, not only are there fewer eggs upon the bunches which are exposed to the sun than upon those growing in the shade, but the light arrests the development of the eggs and kills the young caterpillars; hence the value of stripping the leaves.

Mr. Feytaud has also proved that nicotine and pyridine (the last in a lesser degree) assist, even after having been applied for some days, in keeping the moths from the grapes, by hindering to a great extent, the deposition and the development of the eggs, and by killing by external or internal action a large number of caterpillars. Experiments carried out in the fields, showed the efficacy of nicotine added to cupric mixtures, to soap or to molasses. Pyridine, when used early and in very strong doses (1.5 %), is equally good, and less expensive.

Mr. Feytaud also states that great summer heat and drought caused the almost complete disappearance of the second generation of *Conchylis*. He also found again in the neighbourhood of Bordeaux the egg parasite (*Oophthora semblidis*) (1), which M. Marchal had discovered near Beaune, and made observations upon other natural enemies belonging to the Hemerobiidae (Lace-wing Flies) whose larvae killed the *Conchylis* and *Eudemis* caterpillars.

Mr. Paillot, Chief of the Beaune Station, especially observed in Burgundy, a great variability in the chief date of egg-laying (8-10 days) in the case of vines near each other, but having different exposures and growing at various elevations. This circumstance naturally makes it difficult to fix the exact date for treatment in a given district, and explains, why operations carried out at the same time, and with the same care, have given very various results.

He observed the presence of *Conchylis* upon different species of shrubs, especially dogwood; bushes also serve as a shelter for the

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(1) See *B.* Nov.-Dec. 1911, No. 3263.

moths, so that vines growing near them are most subject to the attacks of the insect.

Mr. Paillot also found that there was sometimes an interval of nearly a day between the hatching of the caterpillar and its penetration into the grape. The same fact has been established by the writer in the case of *Conchylis*.

Mr. Paillot also studied the natural enemies of *Conchylis* especially one of the Hemiptera, which destroys the caterpillars. The more the vine stocks are covered with earth, the greater is the number of the chrysalides which are attacked by fungus parasites.

Lastly, Mr. Paillot made some experiments with washes having arsenate of lead and pyrethrum as bases, and the different methods of using them.

In the course of his biological researches, Mr. Picard, Chief of the Montpellier Station, was able, amongst other things, to prove the occurrence of Eudemis on certain wild plants, especially *Daphne Gnidium*, without any infection of the neighbouring vines. With regard to natural auxiliaries, he found that *Pimpla* attacks only the second generation of *Conchylis*, so that spring treatments are better than summer ones, as they do not hinder the propagation of the *Pimpla*. He also observed in the district of Aigues-Mortes, that the submersion of the vineyards did not suffice to prevent the spread of *Conchylis*, and that watering carried out in July, in the low part of Gard, favoured the development of the second generation which was unimportant elsewhere. This is due to the fact that the presence of water is necessary for the laying of the eggs. Delay in the vintage, even for two days, may have disastrous effects and allow of an enormous number of *Conchylis* remaining in the vineyard, which would otherwise have been destroyed.

Wine-traps have yielded very satisfactory results in Hérault, and the females captured were in excess of the males, the reverse of what occurred in the case of lamp-traps. In the S. of France, it appears that winter treatment and preventive cultural methods are chiefly to be advised.

Mr. Vezin, Chief of the Blois Station, has found amongst other things, that captive moths are only able to deposit their eggs, if water is sprinkled morning and evening.

He further made a list of the varieties of the local vines which are most resistant to the *Conchylis*. He considers that lamp-traps and liquid traps are very efficacious, while emulsions of petroleum, distillate, oil, and carbon disulphide are not.

The Entomological Station of Paris has been chiefly engaged in collecting the data of the chiefs of the various temporary stations,

in order to be able to draw up a definite report. The information is obtained from monthly reports, and chiefly from schedules bearing numbers corresponding to an analytic table. The researches made directly by the Paris Station resulted in the discovery of *Oophthora semblidis* (already mentioned as an egg parasite of *Conchylis* and *Eudemis*) and of *Eulophus* sp. an internal parasite of the Eudemis caterpillar. Mr. Fron found, in the material sent to him by the Station, a new fungus parasite of *Conchylis*, *Spicaria verticilloides*. *S.* (*Botrytis*) *Bassiana* was also found very useful in the control of *Conchylis*. The Station intends prosecuting its researches in this direction.

Mr. Marchal has made, in the ueighbourhood of Paris, observations on the life-history of *Eudemis* and *Conchylis*, and studied especially the first phases of development of these insects.

The insecticides which he found the best, are those with nicotine and pyrethrum. The nicotine proved itself especially efficacions in acting directly upon the eggs at the hatching out of the caterpillars. Pyrethrum, associated with soft soap, seems to be the best insecticide for use during the time when the larvae are destructive. Researches have further been made at the Paris Entomological Station in the preparation of insecticides, some of which have given encouraging results, but the matter still needs further investigation.

Lastly, Mr. Marchal has made a tour of inspection, visiting the different temporary stations, thus being enabled to make further observations on the egg parasites of *Conchylis* and *Eudemis* and on the general life-history of these insects.

724
German
East Africa

The Control of the Diseases and Insect and Other Pests of Cultivated Plants at the Imperial Institute of Agricultural Biology at Amani, German E. Africa. — See above, No. 612.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

Injury to Root Plants by Frost in Russia. — See above No. 652. 725 **Russia**

NASINI, R., CUBONI, G., MATTIROLO, O. **On a Case of Chronic Poisoning of Fruit Trees by Factory Smoke** (Experts' Report). (Sopra un caso di avvelenamento cronico di piante da frutto prodotto da emanazioni gassose di stabilimenti industriali). *Perizia giudiziaria.* — 4 to., pp. 82 + 3 tav. Torino, Vincenzo Bona, 1911. 726

An interesting contribution to our knowledge of the alterations in plants caused by chronic poisoning by sulphur dioxide, has been made by some recent researches on the injury suffered by "chinotti" (*Citrus sinensis* Risso) growing near a factory in the neighbourhood of Savona. **Italy**

All vegetation on the farms in the vicinity of this factory bore very evident signs of wasting away, while its appearance improved as the distance from the smoke-producing centre increased. The plants that suffered most were the trees, that is, the citrus fruits, and the common fruit trees, such as peaches, pears, plums, grapes etc. Many "chinotti" and fruit trees had withered down to the insertion of the graft, and only some shoots from the stock were still alive. The vines were stunted; they had but few canes, their internodes were short and but few bore fruit. Among herbaceous plants, tomatoes showed most the deleterious effects of the smoke; their leaves were curled, pale and partly withered. The greater part of the pods of horse beans had turned brown and were abortive. The least injury was that done to the spontaneous herbaceous plants, among which only a few, and of a limited number of species, showed a paler foliage.

On examination, it proved that the above mentioned injuries were not due to the deposition of minute carbon particles from the

smoke, nor to the action of vegetable or insect pests, nor to frost, wind or the nature of the soil.

On the contrary, both botanical and chemical analyses have shown that the mischief is due to chronic poisoning by the sulphurous vapours emitted by the neighbouring factory, in which 200 tons of coal are distilled daily for the production of sulphate of ammonia, benzol, tar etc. The gases issuing from the chimney contain 0.04 to 0.08 % of sulphur dioxide according to the greater or lesser quantity of air allowed to enter the furnaces.

The injuries observed on the "chinotto" plants are the following: The leaves, though still retaining their normal exterior morphological characters show a lower tone of colour, a yellowness of the edge of the lamina corresponding to the region of the hydathodes and a diminution in the activity of transpiration. These leaves easily drop off, leaving bare twigs which gradually dry up. This withering extends rapidly to the thicker branches until it causes the death of the whole plant, which however tries to react by the production of new buds, the first few of which may even develop, but the succeeding ones end by drying up and falling off.

Corresponding to the exterior appearance of the plants, examination under the microscope reveals a gradual discoloration of the chlorophyll granules, a yellowness of the plasma, and the final dissolution of the granules in the plasmic mass which gradually assumes a more intense yellow brown colour.

The considerable depressions in the tissue, accompanied by buckling of the cell walls, which are produced by the direct action of sulphur dioxide in cases of acute poisoning, were not observed.

The gradual decoloration of the chlorophyll granules and the alteration of the "chinotto" leaf plasms have been experimentally produced in the laboratory, as well as the characteristic spots, due to the direct action of sulphur dioxide on the leaves of apple, pear and service trees.

Vine leaves do not present these typical spots; they show generally a lower tone of colour, and a yellowness which increases from the edge towards the centre of the leaf.

Treating the leaves with methyl green, Congo red or barium chloride gave negative results, as was to be expected, this being a case of chronic poisoning due to minute quantities of sulphur dioxide.

On the other hand interesting results were afforded by investigating the effects of the poisoning on the metabolic processes, with a view to ascertaining the moment in which the plants begin to feel the first injurious effects of sulphur dioxide. The comparison

between the branches of sound and diseased plants bore on the growth of the various annual wood rings.

The principal facts observed on "chinotti" (branches and trunks) as well as on oranges, lemons, pears, and peaches are the following:

1) The diameters of the branches of healthy plants were always considerably greater than the corresponding branches of the same age of sickly trees.

2) The annual woody rings, of the same age both in the branches and in the trunks, were thinner in the sickly plants than in the healthy ones.

3) The effects of frost (1907-1908) were shown by the thinness of the rings of growth, both in the healthy and in the sickly plants.

4) An examination of the rings of growth showed that the decline of the plant did not take place suddenly, but that it was the result of a slow, progressive cause. The same examination rendered it possible to establish, with a certain approximation, the period of vegetation in which the plant began to waste away.

The method followed in these examinations was founded on a number af observations and measurements made in the direction of several radii of the wood, so as to reduce the possible causes of error to a minimum.

The results obtained are summarized in diagrams representing the curve of the production of wood, and the ratio of the various annual rings of wood growth.

These results of botanical analysis are corroborated and completed by the chemical analyses which investigated the composition of the leaves and branches of healthy and of injured trees, the content of sulphates in the soil, and the constituents of the air near the factory.

The determination of the sulphate content of the leaves and branches collected at the same time in the areas of the healthy and of the damaged trees gave the following results, per 100 parts of leaves and branches.

	Quantity weighed for analysis	Barium sulphate	Sulphuric acid %
Healthy leaves . . .	10.39	0.2530	1.02
Injured leaves. . . .	14.53	0.7953	2.29
Healthy branches . .	12.77	0.1512	0.497
Injured branches . .	11.57	0.3514	1.275

on 100 parts of ash.

	Ashes per 100 parts of leaves	Carbon residue	Sulphuric acid
		in 100 parts	of ash
Healthy leaves. . . .	20.63	0.1887	3.30
Injured leaves. . . .	27.50	0.1939	7.—

Calculating from the foregoing data, the amount of sulphuric acid contained in 100 gr. of leaves (*i.e.* in 20.63 of ash from healthy leaves and in 27.50 of ash from injured leaves) was found to be:

Sulphuric acid in healthy leaves.	0.68 %
» » injured leaves.	1.925 %

And, by direct determination, after oxidation by means of nitric acid and calcination in the presence of nitre and of an alkaline carbonate:

Sulphuric acid in the healthy leaves . . .		1.02 %
» » » injured leaves . . .		2.29 %,
The two differences.	1.02 — 0.68	= 0.34
and.	2.29 — 1.925	= 0.365

give the amount of sulphuric acid corresponding to the sulphur contained in the leaves under the form of volatile organic sulphur or of sulphides, or, more probably it is reduced to the form of sulphide by the carbon during the process of incineration and then given off as sulphuretted hydrogen on treatment with hydrochloric acid.

This sulphur, when treated with nitric acid and then with nitre in the presence of an alkali, was oxidised and transformed completely into sulphate.

From the above it is clear that the injured plants have a higher content of sulphates than the healthy plants.

The quantities of sulphates present in the soil on which the injured plants grew, and in that occupied by the healthy ones were found to be as follows:

Sulphuric acid, fine soil, healthy plants. .	0.168 %
» » » injured plants . .	0.143 %

The numerous experimental data regarding the concurrence of injury by sulphurous vapours with an increase in the amount of sulphates contained in the leaves and branches leave no doubt as to the interpretation to be given to the above analyses.

In this case the greater amount of sulphates found in the soil occupied by the healthy plants precludes any objection based on the possible influence of the soil.

The results were the following:

In the most damaged area in the immediate vicinity of the factory, the concentration of sulphur dioxide was found to be about 1 : 27 000. In other tests: 1 : 70 000, 1: 90 000, 1 : 400 000 according to the distance from the factory, the velocity and direction of the wind.

At the borders of the uninjured zone the concentration was found to be 1 : 600 000. Traces were found in a soil on which vegetation showed no signs of having suffered. As it has been demonstrated by experiment (Wislicenus) that sulphurous vapours begin to be deleterious at a dilution of 1 : 200 000, it is evident that the concentration found near the factory was well within these limits.

As a protection against this mischief, the dilution of the vapours within the factory chimneys is recommended. This may be obtained either by raising their height, or by the installation of apparatus for the artificial dilution of the gases on their issuing into the atmosphere.

SABACHNIKOFF V. **The Action of Sulphurous Acid on Pollen.** (Action de l'Acide Sulfureux sur le Pollen). — *Comptes rendus hebdomadaires des séances de la Société de Biologie.* — Tome LXXII, No. 5, pp. 191-193. Paris, 9 février 1912. **727**

France

It is well known that the smoke from certain factories has an njurious effect upon fertilization and upon the formation of fruit.

Studying specially the action of sulphurous acid on pollen, the writer has shown that in an atmosphere saturated with sulphurous acid the pollen of the following plants was killed after 3 to 5 minutes: *Helleborus viridis, H. orientalis, Hepatica triloba* (*Anemone Hepatica*), *Galanthus nivalis, Primula officinalis, Vinca minor, V. major, Convallaria majalis, Narcissus poeticus, Caltha palustris, Cytisus Laburnum, Viola tricolor, Orchis maculata, Billbergia, Eranthis, Crocus.*

Very small amounts of this acid do not often kill the pollen, but the pollen-tube grows abnormally, usually remaining short and taking an irregular form.

This has been proved by the writer in the cases of:

Anemone Hepatica, Billbergia, Helleborus orientalis, Vinca minor, Viola tricolor, Primula officinalis, Lilium candidum, Petunia, Pisum.

The concentration of the sulphurous acid varied from 1 per 1000 to 1 per 300 000, and the duration of its action upon the pollen, from 3 to 48 hours.

It was ascertained that the germinating property of the pollen remained unimpaired after an exposure of 1 to 48 hours to sulphurous acid with a concentration of 1 per 48 000. The germinating property of such pollen is, however, nearly always destroyed, if the latter is exposed for three hours to the action of acid with a concentration below 1 per 13 000.

It may be assumed that sulphurous acid at 1 per 13 000 in ordinary air acting for 24 hours is the fatal limit for the pollen of the plants experimented with.

Pollen which has been exposed to toxic action, and not killed, is capable of germinating in an abnormal manner.

728 REITMAIR O. **Biological Studies of Leaf-Curl in Potatoes.** (Biologische Studien über die Blattrollkrankheit der Kartoffel. Mitteilungen des Komitees zum Studium der Blattrollkrankheit der Kartoffel, Nr. 4). — *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, XV Jahrgang, Heft 1, S. 1-106. Wien, Januar 1912.

Austria

The results of the researches in 1909-1910 of the Committee appointed in Austria for the investigation of leaf-curl in potatoes, are as follows:

1. The first attack of leaf-curl brings about hereditary modifications, which cause, in the descendents of these tubers, a high percentage of badly developed plants.

2. The offspring of infected plants in addition to retarded development, usually also show external symptoms of the disease.

3. The degeneration is hastened when the vegetative conditions are unfavourable.

4. Amongst the varieties cultivated, Magnum Bonum is most liable to the attack of this disease.

5. The size of the tubers is no guide as to their healthiness or suitability as seed.

6. The equal part played by the eyes of the tubers and the shoot-buds above ground, in the spread of the disease, seems to exclude the presence of any organism which transmits the disease by means of the tubers.

7. From the experiments which have so far been made, it seems probable that in addition to the primary stage of the disease, there are two different secondary stages, one of which is inherited

without the intervention of a fungus, and the other due to a second infection by a fungus.

8. It has been impossible to cause symptoms of leaf-curl in the offspring of healty plants either by means of weakening the seed potatoes in every possible way, or exposing them to unfavourable developmental conditions.

BACTERIAL AND FUNGOID DISEASES

BACTERIAL DISEASES.

SCHUSTER, JULIUS. **Potato Rot Caused by Bacteria.** (Zur Kenntniss der Bakterienfäule der Kartoffel). — *Arbeiten aus der K. Biologischen Austalt für Land-u. Forstwirtschaft*, VIII. Band, 4. Heft, S. 452-492, Taf. 1, Abb. 1-13. Berlin, 1912. 729

Germany

In the investigation of the causes of potato rot ("Kartoffelfäule", "Nassfäule") the following pathogenic factors must be considered:

a) obligate parasites which by their own action alone can produce the disease (such as *Bacillus solaniperda*);

b) facultative parasites which can cause the disease but only with the concurrence of certain exterior agents (as *Bacterium fluorescens*, at 35° C.);

c) saprophytes, which cause rot only in dead tissues (as *Bac. amylobacter*);

d) habitual parasites (constitutional) transmissible, and differentiated from the harmless saprophytes (as *Bact. xanthochlorum*).

The symptoms caused by these bacteria are multiform:

a) some cause only the rotting of the tubers (Knollenfäule), as, for example *Bac. solaniperda*;

b) others produce besides a soft rot of the stalks (Weichfäule des Stengels), but without decoloration (*e. g. Bact solanisaprum*);

c) others again besides the rotting of the tubers, and of the stalks, cause also necrosis of the tissues (Schwarzbeinigkeit) without decoloration (*e. g. Bact. xanthochlorum, Bact. phytophtorum*).

Bact. xanthochlorum n. sp. is probably derived from the harmless saprophyte *Bact. fluorescens*, from which it has differentiated itself in the course of evolution under the prolonged action of high temperatures.

Owing to the transmissibility of the pathogenic characters which it has acquired, *Bact. xanthochlorum* represents a « fixed » species, which by infection, through wounds, causes: the wet rot of potato tubers (Nassfäule der Kartoffelknollen), the blackening of the lower part of the stem (Schwarzbeinigkeit) of *Vicia Faba*, the soft rot of the stem (Weichfäule des Stengels) of *Lupinus nanus*, without decoloration; and by infection through the stomata produces the blackening of the leaf veins (Schwarznervigkeit) and the black spots (Schwarzfleckigkeit der Blätter) on the leaves of *Vicia Faba*.

Bact. xanthochlorum produces a series of enzymes which act in conjunction or one after the other: *a*) trypsinic protease which peptonizes proteins and gives as a final results amines and ammonia;

b) a hemicellulase which decomposes the median lamellae, formed of hemicellulose, of the parenchyma cells of the tuber;

c) an amylase which transforms starch grains into amylodextrin;

d) a tyrosinase which causes the blackening of the rotting stems of *Vicia Faba*.

The pathogenic effect of the bacterium is due to the action of a toxin which kills the protoplasm, and to the enzymic action of the specific hemicellulase of *Bact. xanthochlorum*.

The rot in potato tubers appears only after wounds; infection through the lenticels has never been observed.

Bact. phytophtorum Appel always causes blackening of the stems, in consequence of infected tubers having been used as seed, or of the stem having been wounded, with or without the assistance of animals as agents of transmission.

Bact. atrosepticum van Hall, should not be considered as the primary cause of the blackening of potato vines, as it produces only a dry rot of the tubers.

The degree of resistance of the host to the attacks of the bacteria is proportional to the rapidity with which wounds heal. The most resistant varieties are those in which, within 24 hours a continuous layer of corky substances forms beneath the wound

As for means of control, the following are recommended:

1. Avoiding too high a temperature in the store houses, all danger of infection ceasing below 8° C. (46. 4° F.).

2. Keeping the store houses well ventilated and dry.

3. Removing all diseased or damaged tubers.

4. Avoiding too abundant manuring with guano, nitrate of soda, common salt and lime, which favour the development of bacteria, and using instead phosphates, superphosphates and sulphate of ammonia.

5. Uprooting all diseased plants.

6. Carefully selecting resistant varieties.

FUNGOID DISEASES.

GUSSOW, H. T. **Rust in Grain.** *Department of Agriculture. Report of Experimental Farms for year ending March 31st, 1911.* Ottawa; Canada, pp. 257-258. **780**

Canada

Cultivated grasses, varieties of grain and practically all wild grasses are subject to rust disease. Several types of rust may be distinguished. The commonest type " Black Rust ,, (*Puccinia graminis*) occurs on leaves of wheat, rye, oats, and less frequently, barley. Other varieties are " Brown Rust ,, (*Puccinia Rubigo-vera*) and " Crown Rust ,, (*Puccinia coronata*).

It has been proved that rust fungi leave, during some period of their life, the plants on which they originally grew; also that the propagation of the rust fungi is not altogether dependent upon this change of host. This state of affairs renders preventive measures exceedingly difficult.

The prevention of rust diseases would be comparatively easy, if the fungi had to depend for their livelihood entirely upon the secondary hosts. The destruction of these plants would mean an easy solution of the rust problem, but, as it is, this extermination is only one factor in the prevention of rusts. This means of prevention should not, however, be neglected. Seed treatment is of no use whatever as regards rust prevention. It is useful, in the first place, to plough the stubbles of rusted grain immediately after harvest. Grasses, such as the common couch-grass, which serves as a primary host for black rust, should be vigorously exterminated. Further, it is of importance to sow the winter grains as late as

possible, while spring grains should be sown as early as possible According to experience, this practice has resulted in minimizing the severity of rust epidemics. The mechanical or physical condition of the soil does not seem to influence an outbreak of rust; observations have shown that the disease may appear in the same degree on all kinds of soils. On the other hand, it has been repeatedly proven that the chemical condition of the soil plays an important rôle. The use of nitrogenous manures of any kind should be avoided; their use appears to favour the development of rust fungi, while on the other hand, phosphates have shown a very favourable rust-preventing influence. While these observations are worthy noting, the most important factor to reduce the enormous losses due to rust diseases is undoubtedly the use of seed grain obtained from crops free from rust. Some varieties of grain are more subject to rust attacks than others, and in some years the virulence of rust varies greatly in different localities. Farmers should endeavor to ascertain when buying seed grain whether it was obtained from crops free from rust. There are indications that lead one to believe that rust resistance is a fixed character and that crops grown from rust-proof parent stock are far less liable to be attacked.

781 FRON, M. G. **Contributions to the Study of Straw Blight of Cereals** (1). (Contributions à l'Étude de la Maladie du Pied noir des Céréales, ou Maladie du Piétin). — *Annales de la Science Agronomique française et étrangère*, 29e année, No. 1, pp. 3-29, Pl. I-III. Paris-Nancy, Janvier 1912.

France

The disease of straw-blight has been attributed to the action of two special fungi *Ophiobolus graminis*, and *Leptosphaeria herpotrichioides*.

From the examination of numerous specimens of infected stubble from various districts of France, the writer ascertained that this *Leptosphaeria*, which was abundant, was the cause of the malady. He therefore directed his attention chiefly to the study of *L. herpotrichioides*, with the intention of making a biological study of the species.

The disease makes its appearance in May and the beginning of June and, after this, spreads rapidly. Its presence is shown by

(1) See *B*. Dec. 1910, p. 360. *(Ed.)*.

a felt-like formation on the surface of the stalks due to the mycelium.

The affected portions of the stalk assume a grey colour and wither. The plant continues growing but in a feeble manner and, when the ears are formed, it is easily lodged.

The mycelium penetrates into the interior of the cells, localizing itself especially in the vicinity of the vascular bundles. In September, and sometimes earlier, the fructifications of the fungus make their appearance on the stubble. The perithecia, which are black in colour, usually occur between the surface of the stalk and the leaf-sheath of the last, or penultimate, node. When mature, the perithecia penetrate the stem which is already withered, and the ends of the beaks, which are more or less elongated according to the conditions of development, appear outside. Until the perithecia are completely mature, asci and paraphyses are to be found within them, but when these bodies are ripe in November and December, they contain only a mass of spores. From January and February onwards, especially if the winter be cold and dry, the perithecia remain entirely empty. The mycelium, however, continues developing in the tissues of the host, and in the following year, at about the same date as before, gives rise to a still larger crop of perithecia than that of the previous year. The writer assumes that a type of fructification must exist however, suitable for the propagation of the fungus at the beginning of the summer. He thinks the conidia attributed to a new *Cercosporella* (which he names provisionally *C. herpotrichioides*), collected in May 1909 on Japhet wheat, are the summer fructifications of *L. herpotrichioides*.

With regard to the conditions which are favourable to infection by this fungus, the writer's experiments show that, when the young plants first come up and are only a few centimeters in height, infection easily takes place by means of the spores which escape from the perithecia.

The negative result of experiments made upon older wheat plants makes it probable, though not certain, that the latter are only subject to infection during their early stages of development, and in any case, it appears that infection at a later period is rarer and dependent upon special conditions.

The incubation period of the disease is very long and includes all the time which elapses until the disease is signalised by the external signs of lodging and a black discoloration appearing at the base of the stalk. Mr. Fron has also demonstrated that this fungus can only develop in the presence of alkaline, or at least,

neutral substances. In a slightly acid medium its growth is arrested.

The spores retain their vitality for a long time, as long as they are enclosed by the perithecia, on escaping from the latter, they germinate rapidly under suitable conditions, but otherwise they very soon die.

From the resistance shown by the spores to solutions of iron and copper sulphates, the writer shows that the former compounds are much less active than the latter: it requires a 0.5 ‰ solution of iron sulphate to hinder the germination of the spores.

The spores lose their vitality also if exposed to light, especially sunlight, and in dry air.

In the case of ground which is much subject to this disease, the writer recommends delaying sowing, even to the end of the winter (end of January or February), and also using for this reason certain varieties of wheat.

Another precaution is thin sowing, so as to reduce humidity and to allow of light and air reaching the base of the stalks, thus hindering the growth of the mycelium. In sowing in drills, it is advisable to have the rows at unequal intervals, every two being close together.

The writer does not go into the question of the best varieties for cultivation, but he draws attention to the fact that it has repeatedlly been observed that early varieties are the most prone to to the disease in question.

782 GAIN, EDMOND **Infection of Forage Grasses by Ergot.** (Sur la contagiosité de la maladie de l'ergot chez les graminées fourragères). — *Comptes rendus hebdomadaires des séances de la Société de Biologie*, Tome LXXII, No. 5, pp. 189-191. Paris, 9 Février 1912.

France

The writer undertook to determine, by experimental means, whether the infection of forage grasses with the spores of *Claviceps purpurea* is brought about by insect agency only, as seemed likely from the previous work of L. Mercier.

After having collected from the inflorescences of *Holcus mollis*, a certain quantity of "honey-dew ,, containing conidia (*Sphacelia*) of the fungus, he infected thirty specimens of *Lolium perenne*, *Arrhenatherum elatius*, *Phleum pratense* and *Holcus lanatus*. Some of the "honey-dew ,, was used in its natural condition, and some after having been diluted with water.

In less than a month after infection, the disease made its appearance on all the above mentioned plants, soonest on *Phleum;* the sclerotia of the fungus appeared on the places where the conidia had been sown.

The neighbouring plants, which had not been inoculated, were, as a rule, perfectly healthy; in any case, the diffusion area of the fungus was limited to 30 cm. (11.8 inches).

This shows that mechanical transport or contact is sufficient for the spread of the disease.

The action of the wind and the accidental agency of insect visitors (without specific commensalism) is all that is required to bring about the occurrence of the malady.

It has not been proved that the conidia retain their power of infecting grasses after they have passed through the digestive system of insects.

von Istvánffi, Gy. and Pálinkás, Gy. **Infection Experiments with Vine Mildew.** (Infektionsversuche mit *Peronospora*). — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, II Abt., 32. Bd., No. 20-25, S. 551-564. Jena, 6. Februar 1912. 788

The writers have carried out numerous infection-experiments with vine mildew.

On the leaves of large shoots removed from the plant, infection takes place readily and surely, while the cells remain turgid and the leaves are in an atmosphere containing 90 % of the relative moisture of the air and at a temperature of 20 to 22° C. On the fourth day after inoculation a few conidiophores appear on the under surface of the leaf; on the upper surface no sign of infection shows after ten days. Hungary

Experiments in the open, under natural conditions, were made in all kinds of weather — damp, rainy, dry, and very hot. The characteristic leaf-spots appeared in a large percentage of the infected places. Infection also took place on the upper surfaces of the leaves, though less readily and less often than on the lower.

The minimum incubation period was 5 ½ to 7 days, and the maximum 14 to 16 days; but the mycelium may retain the faculty of developing for 3 to 4 or even 7 weeks.

Grapes removed from the plant, like leaves of cut shoots, showed traces of infection after four days. Grapes on the vine, under natural conditions, showed the disease in 12 to 14 days.

Infection on the receptacle of the grape showed in 12 to 13 days, at the base of the pedicel in 14 to 15 days, and on the main stalk, 1 cm. from the base of the pedicels, in 17 to 18 days.

The end of the incubation period is determined by the appearance on the leaf of a greyish-green spot — " Ölfleck " in German.

The writers describe changes in the leaves consequent on the attack of the fungus, and various points connected with the conidia and conidiophores. They further state that there is a distinct relationship between the water-content of the host plant and its susceptibility to infection.

784 RAVAZ, L. and VERGE, G. **Vine Mildew and the Necessary Time for Infection.** (1) (Mildiou: sur le temps nécessaire à la contamination). — *Le Progrès agricole et viticole*, 29e Année, No. 7, pp. 195-196. Montpellier, 18 Février 1912.

France

Experiments made by the writers show that, under suitable conditions, vine leaves become infected if the fresh conidia of *Plasmopara viticola* remain in the water upon the lower surface of the leaves for an hour and a half at most.

785 RAVAZ, L. and VERGE, G. **The Influence of Temperature on the Germination of the Conidia of Mildew.** (Influence de la Température sur la Germination des Conidies du Mildiou). — *Le Progrès Agricole et Viticole*, 33e Année, No. 6, pp. 170-177, 3 fig. Montpellier, 11 Février 1912.

France

Since 1876 many experiments have been made with the object of studying the germination of the conidia and the zoospores of *Plasmopara viticola*, but hitherto without any attention being paid to the question of temperature and its effects.

The result of these researches shows that the evolution of conidia into zoospores is extremely rapid at all temperatures in which the vine can grow, in rainy as well as foggy weather. The optimum temperature for their germination appears to be 25° to 27° C. (77° to 80.6° Fahr.). Above this the number of germinating conidia rapidly declines, and reaches zero at 35° C. (95° Fahr.).

Also the zoospores germinate at low temperatures (from 6.5° C., or 43.7° Fahr. upwards) like the conidia.

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(1) See *B.* Feb. 1912, No. 419. (*Ed.*).

SCHNEIDER-ORELLI, O. ***Gloeosporium fructigenum* in Central Europe and North America.** (Zur Kenntniss des mitteleuropäischen und des nordamerikanischen *Gloeosporium fructigenum*). — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten.* II Abt., Bd. 32, No. 13-19, S. 459-467. Jena, 27. Januar 1912. 736

From comparative researches made by the writer on *Gloeosporium fructigenum* from Switzerland and the United States, there are evidently differences, from a physiological point of view, between the European and American forms.

Switzerland. United States

In America, the fungus lives in the hotter zones and its optimum temperature for growth is about 5° C. (9° Fahr.) higher than that of the European form.

Further, this *Gloeosporium* in Europe is a much less active agent of putrefaction than in America, where it develops greatly on the youngest and immature apples and destroys the crop at an early date. The European form has never hitherto been observed to be the cause of canker of the branches of apple-tree, and experiments of artificial infection of living branches have given negative results.

In America, on the contrary, the fungus in known both as the cause of decay in apples and of apple-tree canker.

EWERT, R. **On the Biological Significance of the Difference in Cold-Resistance of *Monilia cinerea* and *M. fructigena*.** (Verschiedene Uberwinterung der Monilien des Kern und Steinobstes und ihre biologische Bedeutung). — *Zeitschrift für Pfanzenkrankheiten*, Jahrg., 1912; XXII. Band, Heft 2, S. 65-86. Stuttgart, 10. Februar 1912. 737

The researches of the writer have yielded the following results:

1. The spores of *Monilia cinerea* can pass the winter on the mummified fruits of the cherry, morello and plum, and they retain their germinating capacity and power of infection unimpaired. The same thing occurs if the *Monilia* by chance develops upon hard fruits.

Germany

2. The spores of *M. fructigena* generally lose their power of germination as soon as winter sets in, even if the fungus is growing upon a plum-tree.

3. Under the influence of damp heat, *M. cinerea* gives rise to new spores more easily than *M. fructigena*; it is always capable of causing infection and is a parasite more adapted to stone-fruits,

which flower early, than is *M. fructigena*, which makes its appearance later.

4. The power possessed by the spores of *M. cinerea* of surviving the winter, does not only depend on their great resistance to cold, for the spores of *M. fructigena* can also stand very low temperatures without their germinative property being affected.

The different behaviour must be considered as a peculiarity of each of these species, which are so nearly allied from the biological stand-point.

788 BRUSCHI, DIANA. **Enzyme Action of certain Fungi parasites of Fruits.** (Attività enzimatiche di alcuni funghi parassiti di frutti). — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fis., matem. e nat.*, Vol. XXI, 1° sem. No. 3, pp. 225-230 e No. 4' pp. 298-301. Rome, 4-18 Febbraio 1912.

Italy

The writer has studied the toxic action of three fungi, *Fusarium niveum*, *F. Lycopersici* and *Monilia cinerea* on the cells of the fruits which they attack (marrow, tomato, plum) and found that it was not proportionate to the acidity of an extract of the fungus, and disappeared for the most part on cooking. None of the three fungi secrete cellulase (an enzyme which decomposes cellulose); *F. niveum* and *M. cinerea* secrete a pectinase, which liquefies the middle lamella of the cell walls of the fruit, producing a rapid maceration. It is doubtful whether *F. Lycopersici* forms pectinase.

The three fungi contain proteolytic enzymes, which break up the proteins of the fungus, as well as those of the fruits. The pulp of the fruits in autolysis digests its own albumens, but if the juice of both is mixed, a great diminution in proteolysis is observed, or an increase in albumen formation.

It appears, from indirect methods, that we have here, in all probability, a synthetic action produced by the fungus at the expense of the nitrogenous compounds of the fruit.

While *F. niveum* and *F. Lycopersici* use up rapidly their own carbohydrates, as well as those of their host, *M. cinerea* uses up more of its own carbon reserves, in autolysis, than of the sugars of the fruit.

RESISTANT PLANTS.

739 BONDARZEV, A. C. **Disease Resistant Varieties of Peach in the Caucasus.** (Grobneia Boliesnia Persika. Vstrieciaiustciiasia na Cernomorskom Poberejie Kavkasa), — *Jurnal Boliesni Rastenii*, (Journal of Plant Diseases), V. God. No. 5-6, pp. 134-135. S. Peterburg, 1911.

Russia: Caucasus

This is a short note on the principal diseases which attacked peach-trees in the Caucasus in 1911, and is especially interesting from the fact that it enumerates the varieties which are resistant to different diseases.

1. *Exoascus deformans* Fck., has become a veritable scourge; it attacks all varieties indiscriminately, but especially Elberta and Celestial Empire; the early American varieties, Amsden, etc., show a greater power of resistance.

Cercospora cerasella Sacc. attacks especially the variety *Persica foliis atropurpureis* causing the appearance of the characteristic spots on the blade of the leaf. The following varieties are partly immune: Korol Posdnikh (lit. king of the lates), Double Montagne and Early Alexander. Wonderful and Elberta are wholly immune.

Puccinia Pruni-spinosae Pers. causes the withering and fall of the leaves, and chiefly attacks Celestial Empire and Brusskii which it injures most, and Early Alexander, Elberta, etc., which suffer less. Korol Posdnikh, Double Montagne and Wonderful can be considered as resistant.

Amongst other more wide-spread and serious diseases, must be mentioned those due to the attacks of *Sphaerotheca pannosa* Lév., *Monilia fructigena* Pers. and *Cercosporella Persicae* Sacc.

740 WEHMER, C. **The Resistance of Oak Wood to Dry Rot.** (1) (Resistenz des Eichenholzes gegen Hausschwamm). — *Berichte der Deutschen botanischen Gesellschaft*, Band XXIX, Heft 10, S. 704-708, 1 Abb. im Text. Berlin, 25. Januar 1912.

Germany

The resistance of oak wood to *Merulius lacrymans*, though usually assumed, has not so far been discussed or experimentally proved by all those persons who have studied the question.

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(1) See *B.* April 1911, No. 1301; Nov.-Dec. 1911, No. 3249. (*Ed.*).

Mr. Wehmer is able to prove by means of practical experiments, which have been repeated in the laboratory, that oak wood is absolutely immune from the attacks of this fungus.

He mentions, in this connection, a very instructive case: dry rot had badly attacked the wood of two rooms situated on the ground floor and which had two floors one above the other. The lower one, of conifer wood, had been entirely decomposed for two years, while the upper portion, which was of oak, though immediately in contact with the lower, had remained intact, although *Merulius lacrymans* had spread much beneath it, and had made its appearance on the outside between the interstices of the floor. After two more years, the fungus began to fructify on the external portion of the flooring and to cover with its mycelium the oak parquet which it had already displaced, in order to reach the light. None of these pieces of parquet were, however, even superficially attacked; even three or four years after the appearance of the fungus, the flooring remained sound and compact as if the wood composing it were untouched.

MEANS OF PREVENTION AND CONTROL.

741 CAORS, CH. **The Control of Vine Mildew in France.** (Sur le traitement du mildiou). — *Le Progrès agricole et viticole*, 29e année, No. 5. pp. 140-141. Montpellier, 4 Février 1912.

France: Var

At Gonfaron (Var), the writer completed in 1911 his observations with regard to the manner in which infection of *Plasmopara viticola* commences in the vine, and the most efficacious method for the control of this disease.

A plot of vines, Carignan, was subject every year to the attacks of the parasite, and the writer, finding that the first signs of the malady appeared on the lowest leaves, directed the two first sulphurings onto the under surfaces of the leaves which grew nearest the ground. After heary rainfall " the mildew made its appearance; in all the other plots" the vines were considerably injured, but on the treated plot they were little harmed, the fungus having limited its attack, in this first invasion, to certain leaves splashed with earth, which showed a few localized patches.

Three further sulphur sprayings followed, directed chiefly upon the upper surfaces of the leaves, according to the usual practice. The crop was abundant, and far superior to those obtained on the experimental plot during the seven previous years.

In conclusion, the experimenter shows that *Plasmopara* makes its appearance, in the first place, on the under surfaces of the lowest leaves, probably as a direct result of the winter spores being carried on to the leaves by heavy rains. It is therefore necessary to sulphur before the disease makes its appearance, the under surfaces of the leaves nearest the soil being specially treated.

The later infection is due to the conidia of *Plasmopara* being transported to the upper surfaces of the leaves in the manner described by Ravaz and Verge (1) so that sulphuring the upper surfaces is a sufficient prophylactic.

VRONSKII, S. G. **Organization of the Control of Oak Mildew in the Forests of Korabel, Russia** (2). (Borba s Mutcnistoi Rosoi na Dubie v Pitomnikie Korabelnago. Liesnicestva v 1911). — *Liesnoi Jurnal* (Forestry Review), XLI G., Vip. 9-10, pp. 1439-1452. S. Peterburg, Dekabr. 1911. **742**

In the forests of Korabel, in the Government of Volhynia, the oak mildew made its appearance for the first time in 1909, attacking *Quercus pedunculata*, *Q. rubra* and *Fagus sylvatica*.

Russia

The writer, who is the Forest inspector of the district, took energetic measures for checking and controlling the pest. In 1911 he commenced, according to a scheme proposed by Bondarzev, a series of experiments to show which were the most effectual methods of control.

The experiments were divided into seven groups:

1. Dusting with flowers of sulphur.
2. Spraying with lazurina.
3. Spraying with lazurina and flowers of sulphur.

In these first three cases, the treatments were carried out every 15 to 20 days.

4. Spraying with liver of sulphur every 10 to 15 days.
5. Spraying with liver of sulphur and copper sulphate every 20 to 25 days.
6. Sprinkling with " polysulphide " every 15 days.

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(1) See *B.* Feb. 1912, No. 419. (*Ed.*).
(2) See also *B.* April 1911, No. 1298. (*Ed.*).

7. Sprinkling with "polysulphide" and copper sulphate every 15 to 20 days.

In order to judge of the effect of the above-mentioned remedies upon the oak mildew, the following points must be considered:

1. The thickness of the white felt made by the parasite upon the leaves.
2. The scorching of the outer edge of the leaves.
3. The falling of the scorched leaves.

On July 16th 1911, the leaves of the oaks which had been treated with liver of sulphur were not only clearly attacked by the fungus, but many of them were scorched; those of the trees treated with liver of sulphur and copper sulphate were in the same condition.

The polysulphide prevented whitening of the leaves, but could not hinder scorching.

Much more satisfactory results were obtained by dusting with flowers of sulphur, the symptoms of the disease being confined to a slight whitening of the leaves with no trace of scorching or dying.

In agreement with these experiments, the application of flowers of sulphur, on a large scale, in the wooded districts of Korabel was attended with complete success.

748 PINOY, E. ***Merulius lacrymans* injurious to Timber.** (Sur la conservation des bois). — *Comptes-rendus des Séances de l'Académie des Sciences*, tome 154, N. 9, pp. 610-611. Paris, 26 Février 1912.

France

In the course of some researches on the means of protecting wood from the attacks of *Merulius lacrymans*, the author found that pieces of wood immersed, until completely impregnated, in a solution containing 2 % of bichromate and 1 % of sodium fluoride, became, after drying and exposure to light, completely resistant to the action of fungi.

If then the wood is painted with a solution containing 5 % of gelatin, 2 % of potassium bichromate and 0.5 % of sodium fluoride, and again exposed to the light, it aquires, when dry, a brilliant solid polish and a brown mahogany colour that imitates old wood.

The author has also discovered that wood already attacked by the fungus may be protected from further damage by being properly disinfected and then treated as above. He believes that this process will be found useful as a protection against those insects that damage wood.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS.

ULE, E. ***Uredo Manihotis* injurious to *Manihot Glaziovii*** (Die Maniçoba von Cearà u. deren Beulenkrankheit). — *Der Tropenpflanzer*; 16 Jahrg., No. 2, S. 91-95. Berlin, Februar 1912. 744

In September and October 1910, while visiting some plantations of *Manihot Glaziovii* (the well known rubber tree called also "Maniçoba") in the State of Ceará (Brazil) the Author observed that the branches and twigs of many trees were much deformed by large excrescences resembling gigantic gall nuts. Further investigations enabled Mr. Ule to ascertain that these deformities were due to *Uredo Manihotis* P. Henn. which attacks also *Manihot utilis*, and which he had already found in 1892 on wild species of *Manihot* in the State of Goyaz (Brazil).

Brazil: Ceará

Sometimes the fungus attacks only the leaves, causing rust coloured spots; at other times it produces on the branches a kind of witches'-brooms. Probably this parasite is spread throughout the States of Ceará and Rio Grande do Norte. It causes considerable ravages, first by reducing the yield of rubber, and later by causing the death of the branches and eventually of the whole tree.

Up to the present no better method of controlling this pest is known, than the careful pruning of the trees, removing and destroying by fire all the infected parts.

VOGLINO, P. **Canker or Rot of Solanaceae: Egg-Plant, Capsicum, and Tomato.** (La cancrena o marcescenza delle solanacee: Melanzana, pomodoro, peperone). — *L'Italia Agricola*, anno XLIX, No. 3, pp. 56-58, 1 fig. Piacenza, 15 Febbraio 1912. 745

In 1908, the writer noted the withering and drying up of the leaves and fruits of the egg-plant (*Solanum melongena*) due to *Ascochyta hortorum*, which had already been observed in North America upon various *Solanaceae*.

Italy

In 1910, the same fungus occurred in France upon the stems of the egg-plant.

In the course of the year, it was discovered by the writer near Giaveno (Prov. of Turin) on tomato plants.

From the stalks and leaves, upon which cankerous brown spots appeared, the infection soon spread to the fruits which were still green, or on the point of maturing. Finally, there appeared upon these numerous cankerous, circular, black patches of which the surface was grained, and which contained brown, rotting pulp. Spraying with Bordeaux mixture proved to be an efficacious remedy.

In the absence of further experiments, the writer brings forward the hypothesis that the fungus which attacks the egg-plant and tomato may also be the cause of the withering of the capsicum which, of late years, has caused great damage in small disticts of Piedmont.

746 ELENKIN, A. A. **Two Cryptogamic Diseases of Tulip Bulbs.** (O Gribnekh Boliesniakh Lukoviz Tiulpana). — *Jurnal Boliesni Rastenii* (Journal of Plant Diseases), V. G. No. 5-6, pp. 105-124. S. Peterburg, 1911.

Russia

In May 1911, some bulbs of the tulip " Gelber Prinz ", which were affected by a fungus to the extent of 50 % of the crop being destroyed, were sent to the Phytopathological Station of the Royal Botanical Garden of St. Petersburg.

It was discovered, by means of a careful series of experiments, that this disease was caused by two different fungi. One develops in the interior of the bulb, between the scales, and gives rise to a mass of greyish or brown mycelium from which develop conidiophores having at their extremity a large number of small conidia, which may be referred to *Botrytis cinerea*. This fungus always destroys the whole interior part of the bulb and produces numerous small, black, roundish sclerotia about 1-1.5 mm. in diameter, rarely as much as 2 mm. The interior of these sclerotia is occupied by a mass of hyphae composed of numerons fine, colourless hyphae, thickly interlaced and which form round the periphery a brown involucre with a thickness of 10-25 μ.

Infection-experiments with the spores and mycelium of this fungus gave the following positive results. Both morphologically, and in the symptoms of the disease which it produces, this fungus shows so many points of resemblance to the cryptogam which attacks the common onion, that it must be considered a form of *Botrytis cinerea* Pers. It is a very formidable parasite of tulip bulbs, and is readily distinguished from *B. parasitica*, Cav.

Hitherto it has not been possible to obtain from the sclerotia higher forms of fructification.

As for the other fungus, it attacks the tissues of the base of the bulb, the floral buds, and the root. A colourless mycelium developed in the parenchyma, which produced a large quantity of sclerotia, first whitish in colour and afterwards brown, with a diameter of 1.5-2 mm., or rarely as much as 3.5 mm. The sclerotia of the roots have their origin far down in the root-tissues and, in growing, burst the epidermis and unfold in the form of small tumours 0.5-2 mm. in diameter.

Their internal structure (which consists of a mass of white, much-branched hyphae, which interlace and form a fairly loose structure) is almost identical with that of the sclerotia of the bulb, from which they only differ in the dark, almost black, colour of the superficial stratum (6-11 μ).

This fungus destroys the base of the bulb and the floral buds, transforming the tissues into a shapeless mars of sclerotia. The mode of formation of the latter greatly resembles that of *Sclerotium Tuliparum* Klebhan, but differs from it in its method of infection. In the case of *Sclerotium Tuliparum*, the disease progresses typically from above downwards, but the fungus in question first attacks the base of the bulb.

In spite of this biological difference, however, the writer admits that the fungus he has studied may be identified with *Sclerotium Tuliparum*; a more complete determination being impossible owing to its having been, so far, impossible to obtain higher forms of the fructification of either fungus. These two cryptogams usually attack different bulbs, and it is a rare occurrence for *Botrytis cinerea* and *Sclerotium tuliparum* to attack the same plant. The following methods of controlling both these fungi are advised:

1. The uprooting and burning of infected bulbs.
2. The disinfection of the soil with carbolineum in the proportion of 50 litres per are (about 2 3/4 gallons per rod).

OHL, I. A. ***Macrophoma excelsa*, form *infestans*, parasitic on *Abies concolor* in Russia.** (Ob Interesnom Gribkie na Khvoie Amerikanskoi Pikhti v Rossii). — *Jurnal Boliesni Rastenii*, (Journal of Plant Diseases), V G. No. 5-6, pp. 127-134, s 1. otd. Tabl. i 2 ris. v Tek (1 plate and 2 figures in the text). S. Peterburg, 1911. 747

The writer observed, in the district of Prilusk (Gov. of Poltava), a specimen of *Abies concolor* Lindl. and Gord. of which the greater number of the leaves had wilted and some had become quite withered. **Russia**

Numerous pustules appeared upon the leaves. At first covered by the epidermis, but later they burst through and become small black spherical pycnidia with a diameter of 250-300 μ. The walls of these pycnidia are composed of a very dense tissue, the hyphae of which are black on the outside and grey on the inside. From the internal walls, project a large number of basidia 14 μ in length and about 2.5 μ in diameter. The spores formed, are elliptical with rounded extremities, 21 to 26 μ by 9.5 to 11.5 μ, and are granular inside. From the characters of its fructifications, this fungus belongs to the genus *Macrophoma* (Sacc.) Berl. and Vogl., and to the sub-genus *Eumacrophoma*, as its spores are oval and not cylindrical, as are those of the other sub-genus, *Cylindrophoma*.

The development of the disease is easily studied from the fact that green and healthy leaves occur together with infected ones. Probably, we have here to do with a facultative parasite, but before being able to decide upon the matter positively, artificial infection experiments will be necessary.

The writer suggests the name of *Macrophoma excelsa* (Karst) Berl. and Vogl. form *infestans* Ohl. for this fungus.

For its control, the following measures are suggested: the use of fungicides in the spring, and the burning and removal of the infected parts in the autumn.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

748 A ***Loranthus*** **affecting Citrus Trees.** *The Philippine Agricultural Review*, Vol. IV, No. 12, p. 679. Manila, December 1911.

In April 1911, in the neighbourhood of Misamis (a town in the Island of Mindanao), a parasitic plant, *Loranthus secundiflorus*, Merrill, was observed on various species of Aurantieae, especially on *Citrus decumana*. About twenty species of the genus *Loranthus*

Philippines: occur in the Philippines, but *L. secundiflorus* Merrill is, at present, only known there on the Island of Mindanao.

It is not improbable that, with the increase of the zones under cultivation, the parasite may become a source of great danger.

Attention has already been drawn to the damage done by this pest in India and Assam, where it has attacked pear, peach, orange, guava (*Psidium* spp.), and tea.

INSECT PESTS

GENERALITIES.

BORDAS, L. **The Morphology of the Potato Moth (1) Caterpillar.** (Morphologie externe et appareil digestif de la chenille de *Phtorimaea operculella* Zett., parasite de la pomme de terre). — *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, tome 154, No. 7, pp. 450-452. Paris, 12 Février 1912. **749**

Further researches upon the external morphology and digestive apparatus of the caterpillar of the Potato Moth (*Phtorimaea operculella*) show the great vitality of this pest; it can resist for a long time the strongest measures. Thus, after immersion in 72 % alcohol for 6-8 hours, the caterpillar is still capable of contraction and able to move different parts of its body. **France**

This great power of resistance to asphyxiation, which depends upon its tracheal and stigmatic apparatus, explains the small amount of success with which efforts for the control of this insect have been attended, and shows that the only methods of control likely to be effective, will be those directed against the pupae and the adult moths.

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(1) See *B.* Feb. 1912, No. 437. (*Ed.*).

MEANS OF PREVENTION AND CONTROL.

750 D'HERELLE, F. ***Cocobacillus Acridiorum* as Means of Controlling Locusts in Argentina** (1). (Sur la propagation, dans la République Argentine de l'epizootie des sauterelles du Mexique). — *Comptes rendus hebdomadaires des séances de l'Academie des Sciences*, Tome 154, No. 9, pp. 623-625. Paris, 26 Février, 1912.

Argentina

At the request of the Argentine government, the Author experimented with *Cocobacillus Acridiorum* n. sp. — (which he had isolated from the intestinal contents of Yucatan locusts (*Schistocerca pallens* Thumb.) — on the locusts which every year ravage a part of the territory of the Republic.

The infection experiments which commenced in December 1911, were made at first upon the migratory locusts of the Parana region (*Schistocerca paranensis* Burm). Three cages, each containing 250 to 300 locusts, were used. The first cage was infected by some lucerne which had been moistened with 20 c. c. of culture broth. All the locusts died within five days; the same result was obtained in the same time in the experiment on the locusts of the second cage, in which four locusts which had died in consequence of the injection into them of one drop of culture broth, had been placed.

In the control cage, after five days, only five dead locusts were found; they had probably been injured during transport, and they showed no trace of *Cocobacillus* which had been found, as an almost pure culture, in the intestinal contents of the locusts kept in the other two cages.

These experiments having been repeated always with the same success, the Argentine government decided to infect some parts of the province of Santa-Fé.

The culture broth, in doses of about one to six pints, was poured on the ground or sprayed on some locusts, and it caused in a short time a great destruction of these pests. A few days after the first infection the disease had spread to a distance of three miles.

The propagation of the infection is possible with any species of locust.

As a consequence of these results the Government has decided to infect all the invaded territory.

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(1) See *B.* May 1911, No. 1561. (*Ed.*).

The Protection of Birds in Switzerland. (La protection des Oiseaux en Suisse). — *Journal forestier Suisse*, 27ème Année, No. 1, pp. 10-11. Berne, Janvier 1912. 751

Article 17 of the Federal law of the 24 th. June 1904 on game and on the protection of birds places under the protection of the Confederation the following birds: All insectivorous species, namely Warblers (*Sylvia* spp.), Wheatears (*Saxicola* spp.), Titmice (*Parus* spp.), Hedgesparrows (*Accentor*), Pipits (*Anthus*), Swallows (*Hirundo* spp.), Flycatchers (*Muscicapa* spp.), Wagtails (*Motacilla* spp.), Larks *Alanda* spp.), Starlings (*Sturnus* spp.), Thrushes and Blackbirds (*Turdus* spp.), with the exception of the Field fare (*T. pilaris*), the Redwing (*T. iliacus*) and the Mistletoe-thrush (*T, viscivorus*), the Chaffinch (*Fringilla caelebs*), the Goldfinch (*Carduelis elegans*), the Siskin (*Chrysomitris spinus*) the Serin (*Serinus serinus*), and the Citril Finch (*Citrinella alpina*) ; the Cuckoo *Cuculus* spp.), the short-toed Tree-creeper (*Certhia brachydactyla*), the Nuthatch (*Silta caesia*), the Wry-neck (*Yunx torquilla*), the Hoopoe (*Upupa epops*) and all the species of Woodpeckers (*Picus* spp.); among Corvidae the Jackdaw (*Corvus monedola*), the Alpine Chough (*Pyrrhocorax alpinus*), the Cornish Chough (*Tregilus graculus*) ; among birds of prey, the Kestrel (*Falco tinnunculus*) and all nocturnal brids of prey with the exception of the Eagle owl (*Bubo maximus*) ; among water fowl the stork and the swan.

Switzerland

There is also an International Convention for the Protection of Birds useful to Agriculture, drawn up on the 30th May 1902 and in force sinee the 6th December 1906. The birds named in the above agreement are absolutely protected, as it is made unlawful to kill them at any time of the year and to destroy their nests, their eggs or their nestlings. The States which have accepted this convention are the following: Austria-Hungary, Belgium, France, Germany, Greece, Lichtenstein, Luxemburg, the Principality of Monaco, Portugal, Spain and Sweden.

BRYANT, H. C. **Birds feeding on Butterflies.** (Distaste of Birds for Butterflies). — *Nature*, Vol. 88, No. 2207, p. 516. London, February 15, 1912. 752

In the examination of some 40 000 stomachs by the U. S. Biological Survey there have been but few instances where birds have been found to feed on butterflies. This fact makes of still greater interest the results of the investigation carried on by the California Fish and Game Commission with respect to an outbreak of butter-

United States: California

flies (*Eugonia californica*) in Northern California during the summer of 1911.

During the early part of the summer the snow brush (*Ceanothus* sp.) was entirely defoliated by the work of the larvae of *Eugonia californica* in many places in the mountain districts of the northern part of California. During the latter part of July and the first weeks of August the great army of caterpillars had transformed into butterflies. These insects were so numerous that the ground was often blackened by them, and great swarms of them filled the air from morning until evening.

Field observation showed the Brewer Blackbird (*Euphagus cyanocephalus*) to be the most efficient destroyer of the butterflies, certain individuals being obserded to eat an average of five butterflies a minute. Two other birds, the Western Kingbird (*Tyrannus verticalis*) and the Western Meadowlark (*Sturnella neglecta*), were seen to feed on the insects.

Stomach examination revealed the fact that two other birds. the Blue-fronted Jay (*Cyanocitta stelleri frontalis*) and the Say Phoebe (*Sayornis sayus*), fed on the butterflies to some extent. Sixty-one stomachs in all were examined, representing twenty-one different speeies. Forty-five species of birds were noted in the locality where the investigation was carried on.

The most important fact brought out by the work was that birds will turn to food which is abundant and readily accessible, even though it be a little relished type of food.

758 SAVASTANO L. **Lime-Sulphur Mixture** (1) **and its Use in the Control of the Scale-Insects of Citrus Trees.** (La manipolazione della poltiglia solfo-calcica: formola della Stazione sperimentale di Agrumicoltura). — *R. Stazione sperimentale di Agrumicoltura e Frutticoltura in Acircale. Bollettino* N. 2, (2ª edizione), 9 pp., 10 Gennaio 1912.

Risultati degli esperimenti con la poltiglia solfo-calcica (formola della Stazione di Agrumicoltura) eseguiti durante il 1911 contro talune cocciniglie degli agrumi. — *Ibidem, Bollettino* N. 3, 6 pp., Dicembre, 1911.

Italy: Sicily. Campania. Calabria. Liguria

Lime-Sulphur mixtures are compounded according to very variable formulae.

(1) See *B*. Feb. 1912, No. 423. *(Ed.)*.

After careful experimental investigation, the Royal Station for the cultivation of Citrus trees at Acireale (Catania) selected and adopted the following formula for practical use.

Lime	1 kg.	10 lbs.
Sulphur.	2 kg.	20 lbs.
Water.	10 litres	10 gallons

The writer, the Director of the Station, describes minutely the method of preparing this mixture, which according to him, is a real remedy and serves at the same time as an insecticide and fungicide.

At the request of the Department of Agriculture, the Station has conducted a series of experiments with the object of determining the composition of the mixtures for use in the case of the different scale-insects of Citrus trees, especially in the control of *Chrysomphalus dictyospermi* Mask.

The first series of experiments was made by the writer near Catania, and a second series by the fruit-growers of Sicily (in the provinces of Trapani, Messina, Syracuse, Palermo, Catania) and of the main land of Italy (in the provinces of Salerno, Reggio Calabria and Genoa).

These experiments resulted in the following conclusions:

1) A mixture diluted to 4 % gave the best results in the case of *C. dictyospermi*; the results were good but not yet very reliable, in the case of some other scale insects which infest citrus trees, but negative in that of *Dactylopius* (*pseudococcus*) *Citri*, when the spraying was done in summer. Mixtures of 2 % or 3 % gave bad results, those of 5 % and 6 % have yet to be tried.

2) The best time for spraying is the summer, but this treatment can equally well be carried out when the crop is all gathered before flowering.

3) When the scale insects are very numerous, spraying must be done in good time if damage at flowering-time, or when the fruit ripens is to be prevented. Spraying must not be carried out at blossoming time, or when the buds are young, for fear of scorching. Further, in such cases, especial care must be used in all cultivation (ploughing, manuring, grafting and irrigation).

4) It is impossible to state exactly the number of sprayings necessary; two may be enough, but sometimes four or five are required.

INSECTS INJURIOUS TO VARIOUS CROPS.

754 British India: Bengal

Insect Pests of the Cotton Plant, in Bengal, British India. — See above N. 656.

755 Egypt

The Cotton Boll Worm *(Heliothis armigera)* injurious to the Cotton Plant in Egypt. — See above No. 657.

756

BASSIÈRES, EUGÈNE. ***Delphax Saccharivora*, a pest of the Sugar-Cane in Martinique.** (La maladie de la canne à sucre à la Martinique). — *La Sucrerie indigène et coloniale*, 48e année, tome LXXIX, No. 2, pp. 27-32. Paris, 9 Janvier 1912.

Martinique

At the end of 1910, an insect was observed for the first time in the Commune of Saint-Esprit, upon 15 ha. (37 acres) planted in sugar-cane; its presence was signalised by the withering of the leaves and the more or less complete hindrance of growth.

From this first centre of infection, the pest spread gradually over the island and seriously damaged the sugar-cane crops.

The writer, the head of the agricultural service in Martinique, reports that in October last he was able to ascertain that the damage done in the infected area was due to a *Delphax saccharivora* Westor, one of the Hemiptera well-known to the sugar-cane planters of the neighbouring English Colonies. He states that the propagation of the insect was favoured by three different causes: the carelessness of the cultivators, who neglected the control of the pest on its first appearance; the custom of using large quantities of mineral fertilizers on the plantations, and scarcely ever employing farm-yard manure, and finally, the almost complete absence of insectivorous birds in the sugar-cane plantations.

M. Bassières advises the following method of control:

1) When the large or small canes are badly attacked it is necessary, as far as possible, to burn the infected zones. The canes could then be sent to the mill without further trouble.

2. In the case of tall canes, which have suffered less severely and can thus, without much loss, beallowed to grow till the usual

time of harvest, it is sufficient to cut them as soon as possible after burning.

In the mean time, and in inaccessible places a partial burning will be advisable, and also the collection of the eggs of the insect, etc.

3. Young canes, intended to be cut in 1913, and which are, so far, not irremediably affected, should be treated with insecticide.

For this purpose, the writer recommends various emulsions: with petroleum and soap bases according to the American Stations and Hubbard-Riley formulae; with a basis of petroleum and hot milk; bases of soft soap, tobacco juice, sodium carbonate and alcohol; of soft soap und spirits of turpentine; of soft soap and commercial ammonia.

The preparations of petroleum and of ammonia seem to be the most efficacious against the majority of the insects belonging to the same family as *Delphax*.

TELLEZ, OLIVERIO. ***Heterodera radicicola*** (1) **on the Roots of Coffee.** (Las Anguillalas de las Raices del Cafeto).—*La Hacienda*, Vol. VII, No. IV, pp. 119-121, 3 figg.; and No. V, pp. 147-148, 1 fig. Buffalo, N. Y., U. S. A., Enero-Febrero 1912. **757**

Mexico: Oaxaca

The writer observed at Teotitlán (Oaxaca) the presence of *Heterodera radicicola* on the roots of coffee. The infection had assumed considerable proportions; in some cases, the plants which were affected quickly succumbed. Hitherto *Heterodera* has been found more or less abundant in the following districts of the State of Oaxaca: Culicán, Teotitlán, Juquila, and Pochutla.

In 16 of the most affected plantations, of Oaxaca, in which the diseased shrubs only amounted to 2 %, the writer calculated that the loss was about $19 125. Every plant which was attacked gave a crop 90 % less in weight than the usual amount. The Liberia, Maragogipe, and Borbón varieties of coffee are, according to the writer, the least subject to this pest. He considers that calcium carbide has, hitherto, given the best result of the numerous remedies which he mentions.

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(1) See *B.* March 1912, No. 587. (*Ed.*)

758 NOEL, PAUL. **Diseases and Parasites of Broad Beans, French Beans, Onions, Leeks and of Celery.** (Les ennemis des fèves et des haricots [*Phaseolus*]. Les ennemies des oignons et poireaux [*Allium*]. Les ennemis du céleri). — *Bulletin du Laboratoire régional d'Entomologie agricole*, 1er trimestre 1912, Janvier-Février-Mars, pp. 4-5 et 7-9. Rouen, 1912.

France

Diseases and parasites of Broad Beans and of French Beans: *Bruchus rufimanus* Schk., *B. irresectus* Faohr, (*B. obtectus*), *Aphis* (*Tychea*) *Phaseoli* Pass., *A. Papaveris* Fb., *Mamestra Pisi* Hb,, *Calocampa exoleta* S. V., *Tylenchus devastatrix* Kühn, *Colletotrichum Lindemuthianum* Sacc., *Erysiphe communis* Wallz. *Sclerotinia Libertiana* Fckl., *Uromyces Phaseoli* Wint., *Peronospora Viciæ* Pers,: *Dematophora necatrix* Hartig, *Uromyces Fabae* Pers., *Isariopsis griseola* Sacc.

The following is according to the writer a list of the different pests of onions and leeks: *Acrolepia betulella* Curt.; *Lita vigeliella* Dup., *Loxostege sticticalis* L., *Drosophila phalerata* Mg., *Eumerus strigata* Mg., *E. aenea* Mg., *Anthomya ceparum* Mg., *A. furcata* Bé., *A. platura* Mg., *Tylenchus devastatrix* Kühn, *Puccinia Porris* Wint., *Urocystis cepulae* Frost., *Botrytis cana* Sor., *Peronospora Schleideni* Ung.

The writer mentions the following parasites and diseases of the celery: *Papilio machaon* L., *Mamestra dysodea* S. V., *M. chenopodi* S. V., *Agrotis plecta* L., *Aspilatus* (*Diastictis*) *artesiana* S. V., *Oecophora minutella* Mus. Schiff., *Tripeta Heraclei* Lw,, *Piophila Apii* Westw., *Cercospora Apii* Fr.

759 TRABUT. **The "Khamedj" of the Date Palm.** (Le Khamedj du dattier dû au *Phoenicococcus Marlatti*). — *Comptes rendus hebdomadaires des séances de l'Academie des Sciences*, Tome 154, No. 5, pp. 304-305. Paris, 29 Janvier 1912.

Algeria. Tunis

"Khamedj", or rottennes of the date bunches, is considered by the natives who cultivate the oases of the Algerian and Tunisian Sahara, to be the worst disease which attacks the date-palm; the percentage of trees affected is 5 %.

The disease makes its appearance a short time after fertilization; the bunch withers before developing. The writer studied "Khamedj" carefully during December, and found (as in the observations of W. Swingle) that all the date-palms were badly infested by a scale-insect, *Phoenicococcus Marlatti* Cock., which lives in rather large colonies at the base of the lower swollen parts of the leaves and at the bases of the spathe and the bunches.

Trade in the shoots of this plant has carried the parasite to the coast of the Algerian Tell, to Australia and America. *Phoenicococcus Marlatti* is also to be found in Egypt and probably in all the oases of Africa and Asia. Plants grown from seed are free from this enemy.

Sulphuring in spring, at the time of fertilisation, prevents the young migratory larvae from finding their way to the date-bunches.

The date-palm is often very seriously injured by another scale-insect, *Parlatoria Blanchardi*, which is very different from *Phoenicococcus*.

Insect Pests of the Avocado in Hawaii. — See above, No. 669. 760 Hawaii

761 FROGATT, WALTER W. **A Weevil, *Aesiotes leucurus*, Pascoe, destructive to Pine Trees, *Pinus halepensis*.** — *The Agric. Gazette of New South Wales*, Vol. XXIII, Part 1, pp. 55-56, 1 Plate. Sydney, January 2, 1912.

The writer mentions that *Pinus halepensis* has been much injured by *Aesiotes leucurus*; the trees were infested with the larvae, pupae, and perfect beetles in all stages of development. The larvae, when full-grown, eat a shallow cavity in the sap-wood. The insects could have been killed, under the bark had they been noticed when they first appeared, by tapping them out with a small chisel or gouge. The trees may recover this season, but if the larvae and pupae in the timber at the present time emerge, next season will certainly end the life of the trees. N. S. Wales

The writer proposes that the adult beetles should be trapped on the tree trunks by putting bandages or sheltering places for them to hide in during the day, where they could be sought, collected and destroyed.

762 OL, J. A. **Injury caused to the Larch by *Coleophora laricella* in Russia** (1). (Listvennitcnaia Mol, *Coleophora laricella* Hbn.). — *Xurnal Bolicsni Rastenii* (Journal of Plant Diseases), V. G., No. 5-6, pp. 136-139, S 2 ris. v tek. (with two figures in the text). S. Peterburg, 1911.

In many districts of Russia proper, and also in extensive zones in Finland, the larches are often much injured by *Coleophora lari-* Russia

(1) See also *B*. March 1911, No. 987. (*Ed.*)

cella Hbn. The female of this insect, when fertilised, deposits its eggs, which are of a yellow colour, on the leaves of the larch; the larvae hatch out in a few days and penetrate into the tissue which they devour or deform.

The leaves which are thus attacked, wilt, shrivel up and fall, and when the number of larvae is considerable, the growth of the trees is almost stopped; death sometimes ensues. Amongst the enemies of this insect may be mentioned some endophagous hymenoptera which destroy the larvae, and birds, which live on the adult insects. Meteorological conditions further can contribute to the destruction of *Coleophora*; thus, an early spring causes the larvae to hatch out before the larch buds, which form their exclusive food, have unfolded; late frosts destroy the young leaves and the larvae within them, while stormy weather in May prevents the females laying their eggs.

INJURIOUS VERTEBRATES

768 **Destruction of Sparrows** (1). (Gegen die Sperlingsplage). — *Schweizerische Landwirtschaftliche Zeitschrift*, XL Jahrg., Heft 5., S. 103-104, Fig. 19. Zürich, 2 Februar 1912.

Switzerland

For dealing with Sparrows, the use of artificial nests is recommended. These should be made of strong pottery and suspended, up to the beginning of April at the latest, from roofs, huts, houses, etc., about 8 ft., from the ground.

The nests should be inspected every fortnight and the eggs removed.

These nests are sold at from 0.60 to 0.70 fr. ($5\,{}^3/_4\,d$ to $6\,{}^3/_4\,d$) each.

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(1) See *B*. Jan. 1912, No. 271. (*Ed.*).